RAILROAD GAZETTE

FRIDAY, SEPTEMBER 16.

NEWS OF THE WEEK.

We give below, in a condensed form, the leading news items of the week. These items will be found in detail in their appropriate columns.

Meetings next Week.—Cleveland & Wheeling.

Elections.—Chicago, Rock Island & Pacific, E. St. John, General Manager.—Duluth Terminal, A. N. Wilson, President.—Louisiana, New Orleans & Texas, Benjamin Wilson, Superintendent.—Norfolk & Columbia, Samuel Conover, President.—Pennsylvania, Poughkeepsie & Boston, W. W. Gibbs, President.—Poughkeepsie, Hartford & New England, Elverton R. Chapman, President.—Sheffield & Birmingham Coal, Iron & Railway Co., E. W. Cole, President.

New Companies Organized.—Decatur & Western Nebraska is incorporated in Nebraska.—East & West is organized in Tennessee.—Indiana & Western is organized in Illinois.—Kansas, Missouri, Arkansas & Natchez files charter in Kansas.—Macon, Tuscaloosa & Birmingham is incorporated in Mississippi.—Pennsylvania, Pougheepsie & Boston is organized in Pennsylvania.—Port Townsend & Southern is incorporated in Washington Territory.—Sheffield & Birmingham Coal, Iron & Railway Co. is organized in Alabama

Changes and Extensions.—*California :* Peninsula railroad is being surveyed.—*Colorado :* Denver & Rio Grande lays third railfrom Pueblo to Trinidad. Denver, Utah & Pacific is to be extended.—*Dakota :* St. Paul, Minneapolis & Manitoba completes Watertown extension.—*Indiana* : Southern Ohio River is completed from Lawrenceburg to Rising Sun.—*Kansas :* Southern Kansas extends branch 13 miles.—*Minnesota :* Winona & Southwestern lets contract for building.—*Missouri :* Kansas City, Independence & Park is completed. Cape Girardeau Southwestern will be extended.—*Montana :* St. Paul, Minneapolis & Manitoba reaches Fort Assinboine.—*Nebraska* : Missouri Pacific begins on Hastings branch.—*North Carolina :* Raleigh & Gaston will build from Henderson to Franklinton.—*Ohio :* Marietta, Columbus & Northern surveys extension.—*Virginia :* Lynchburg, Halifax & Durham begins work. Norfolk & Columbia will build line.—*Wisconsin :* Freeport, Dodgeville & Northern begins work.

Leases and Sales.—Buffalo, New York & Philadelphia, Buffalo Division is sold.

Traffic.—Anthracite coal shipments for week ending Sept. 10 show increase of 4.5 per cent. as compared with corresponding period last year ; bituminous shipments show increase of 16.2 per cent. Cotton receipts, interior markets, for the week ending Sept. 9, show an increase of 46.0 per cent. as compared with the corresponding week last year ; shipments show increase of 29.4 per cent. ; seaport receipts show increase of 100.6 per cent. ; exports, an increase of 70.2 per cent. Cotton in sight is less than at same date last year by 31.4 per cent.

Miscellaneous.—Atchison, Topeka & Santa Fe has laid 746 miles of new track since Jan. 1, 1887.—Carolina, Knoxville & Western and Atlantic, Greenville & Western consolidate.

Contributions.

The Problem of the Locomotive Side-Bar.

ST. LOUIS, Sept. 8, 1887.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Probaby no one part or member of the entire rolling stock plant of a railroad admits of a more accurate computation or scientific designing than the side-bar joining a pair of locomotive drivers, and yet the forms now in use are mostly the results of pure empiricism, their only justification being that they have not yet broken. The breaking of side-bars on passenger locomotives is of frequent occurrence, however, and the damage is liable to be serious. If these members should be designed rationally, to carry the known stresses to which they are to be subjected, they could be made absolutely safe.

We may divide the stresses to which a side-bar is subjected into two classes, the known and the unknown.

The known stresses arise from the thrust and pull of the piston, and also from the upward and downward throw of the rod. The direct thrust and pull are uniformally distributed over the cross-section of the bar, but the centrifugal force, which tends to bend the bar upward at the top and downward at the bottom of its path, causes a bending movement throughout the bar, alternately in opposite directions, and the stresses resulting from this action are greatest on the extreme top and bottom fibres at the middle of the bar. These bending stresses cause tension in the top fibres and compression in the bottom fibres, when the bar is at the top of its path, these stresses being reversed at the bottom of its path. This class of stresses is called known, because for given known conditions they can be accurately computed.

The unknown stresses arise from various causes, such as rough track, non-parallelism of axles of drivers, erroneous quartering of drivers, difference in size of drivers, thus causing one to slip, etc. The stresses in the bar from such causes cannot be computed, and a certain factor of safety should be used to cover such causes. But because a member is to be subjected to certain incomputable stresses is no reason for not designing it at least strong enough to carry the computable ones which it is known will come upon it. I propose to show that the known, or computable, stresses are more than sufficient to break a large proportion of the side bars now in use.

Of the two kinds of known stresses, those due to the centrifugal force of the bar are far greater in magnitude than those due to the pull and thrust of the piston. In fact, when the centrifugal force is greatest the engine is running at its maximum speed, and this is probably attained on a down grade when no steam is on, so these two kinds of stress probably do not both act to their maximum amount at the same time.

Stress Due to Centrifugal Force.

It will be shown that the centrifugal stresses alone are sufficient to explain the breaking of side-bars, and that if they were designed to resist this action alone, most of those now on passenger locomotives would have to be strengthened.

The centrifugal force of a body moving in a circular path is

$$F = \frac{w\, v'^2}{r\, g} \qquad (1)$$

Where w is the weight of the body in pounds.

v' is the velocity of the body in its path in feet per second.

r is the radius of the circular path.

g is the acceleration of gravity = 32 feet per second.

If the bar is of uniform cross section this force acts as a uniformly distributed load in an upward direction at the top and in a downward direction at the bottom of the bar's path. This load causes a bending moment at the centre of the bar equal to

$$M = \frac{F\, l}{8} \qquad (2)$$

where l is the length of the bar in inches.

This bending gives rise to tension on one side and compression on the opposite side of the bar, the numerical value of these stresses in pounds to the square inch being:

$$f = \frac{M\, h}{2\, I} \qquad (3)$$

where h is the height of the bar (the section being symmetrical), I is the moment of inertia of the cross section. If the section is rectangular, then this becomes:

$$f = \frac{6\, M}{b\, h^2} \qquad (4)$$

where b is the breadth and h the height of the bar, both inches.

If we wish to use the velocity of the train in miles per hour we have

$$v' = \frac{22}{15}\frac{s\, v}{d} \qquad (5)$$

where v' is the velocity of the crank pin in feet per second.

s is the length of stroke.

d is the diameter of the driver.

v is the velocity of the train in miles per hour.

For Rectangular Bars we may, by making the proper substitutions in the above equations, obtain the following very simple formula for designing a side bar for any case:

$$f = \frac{1}{3}\frac{s}{h}\left(\frac{l\, v}{d}\right)^2 \quad \text{or} \quad h = \frac{1}{3}\frac{s}{f}\left(\frac{l\, v}{d}\right)^2 \qquad (6)$$

where f = stress in extreme fibres in pounds per square inch.

s = stroke of engine in inches.

h = height of side-bar in inches.

l = length of side-bar in inches.

d = diameter of driver in inches.

v = velocity of train in miles per hour.

The first form of equation (6) is used to find what stresses a given bar is subjected to, and the second form is used to determine what height to give a bar for certain other fixed conditions.

It is to be observed that *the stress in the extreme top and bottom fibres is independent of the breadth or thickness of the bar.* That is to say, a thick bar of a given depth is just as likely to break from this cause as a thin one of the same depth. The reason for this is that the increased breadth increases both the centrifugal force and the strength in the same ratio.

For rectangular bars, therefore, the *depth* is the only significant thing, so far as the centrifugal force is concerned. To carry the direct thrust, however, it must have thickness enough to prevent its buckling, which in general would be about 1½ inches.

Example: The following dimensions are taken from Baldwin locomotive No. 8,021, 1886, which happened to come under the writer's notice, and is probably by no means an extreme case. The fact that it is only one year old shows that it conforms to modern practice.

The dimensions are :

Length of bar (c. to c. of pins)	$l = 100$	in.
Height of bar	$h = 3\frac{3}{4}$	"
Thickness of bar	$b = 1\frac{3}{4}$	"
Diameter of driver	$d = 60$	"
Length of stroke	$s = 24$	"

This is a passenger locomotive, and doubtless is liable to be run, for short intervals, at an extreme speed of 70 miles an hour, whence we will let $v = 70$.

Taking the first form of equation (6), and making the proper substitutions, we have for the stress on the extreme fibres of the bar :

$$f = \frac{1}{3}\frac{s}{h}\left(\frac{l\, v}{d}\right)^2 = \frac{24}{3\times 3\frac{3}{4}}\left(\frac{100\times 70}{60}\right)^2 = \mathbf{29{,}000\ lbs.\ per\ sq.\ in.}$$

This is the stress due to the centrifugal force alone. If the engine is working steam at the same time this would have to be increased by about 1,000 lbs.

This result is not based on any assumption, except the speed of seventy miles an hour, which it would seem any passenger locomotive is *liable* to reach for short intervals, at the foot of a grade for instance. Should this locomotive ever attain to this speed, even though the steam is shut off and there be none of the incomputable causes acting, the side bar will be strained beyond its elastic limit, and will be bent upward and downward alternately, and will, without any kind of doubt, soon be fatigued, or crystalized, and will break.

Wohler and Spangenberg have found that the best wrought-iron cannot be strained beyond 16,000 lbs. per square inch in alternate directions without danger of ultimate failure. Within this limit good wrought-iron may be strained in opposite directions an infinite number of times without failure. The number of revolutions to which a locomotive side bar is liable to be subjected is so great as to be practically infinite, so far as this action is concerned, and hence this safe limit should in no case be exceeded.

When account is taken of the direct thrust, and of all the incomputable contingencies, it would seem that the centrifugal action alone should not be allowed to give rise to stresses greater than say 12,000 lbs. per square inch for velocities of 70 miles an hour for passenger engines, and 50 miles an hour for freight engines.

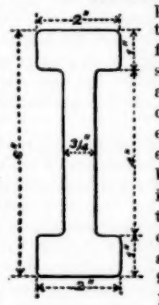
To find the proper depth of bar for the example given above, for a velocity of 70 miles and a fibre strain from centrifugal force of 12,000 lbs. we will use the second form of equation (6) and obtain:

$$h = \frac{1}{3}\frac{s}{f}\left(\frac{l v}{d}\right)^2 = \frac{24}{3\times 12000}\left(\frac{100\times 70}{60}\right)^2 = \mathbf{9\ inches.}$$

This depth appears excessive when compared to the common practice, but it cannot be diminished without endangering to some degree the life of the bar.

As a rule the bars on freight engines are much shorter than on passenger engines, and the velocity also is less, and since the depth varies as the square of the length and velocity, the depth of freight engine side bars might be very much less than that of passenger side bars. As a rule, however, the practice is the other way, the side bars on heavy freight engines being very much deeper than those of passenger engines. One reason, doubtless, for making the passenger engine bars so shallow is to give the engine a lighter and neater appearance. A bar 9 in. deep would certainly look heavy and awkward, but there is no avoiding it if plain bars are used and the length and velocity are maintained.

Of late years the I beam cross-section has been considerably used. This is theoretically the best form of bar for the purpose, but it is a more expensive bar to make, and the depth would still have to be great. To compute such a bar we would have to use equation (3) to find the fibre stress. We can, from that equation, show that the form of cross-section given in the accompanying figure has the same fibre stress (12,000 plbs.) as the flat bar 9 in. high. Since the flat bar shoul be at least 1¼ in. thick for stiffness against thrust, its area of section would be 13½ sq. in., while the area shown in the figure is but 7 sq. in., or about the same as the bar now on the engines considered above. It is, however, 6 in. high instead of 3¾ in., and being of about the same weight, its maximum fibre stress is reduced from 29,000 to 12,000 lbs. to the square inch. The centrifugal force of these two bars, with a velocity of 70 miles per hour, is about 9,500 lbs. while that of the 9 in. by 1¼ in. flat bar would be about 19,000 lbs. The strain on the pins and connections is therefore only half as much with the I-beam section as with the solid flat section giving the same fibre stress.



From the foregoing may be drawn the following

Conclusions.

1st. On fast running locomotives all other stresses in side bars are insignificant, as compared to that from the centrifugal force.

2d. That the extreme fibre stress from centrifugal force varies inversely with the depth of the bar, and is independent of the breadth.

3d. That the extreme fibre stress varies directly with the square of the length of the bar, and also with the square of the velocity of the train.

4th. That the extreme fibre stress varies directly with the length of the stroke, and inversely as the square of the diameter of the wheel.

5th. That most side bars now in use on passenger engines are too shallow, and that a large proportion of them are positively dangerous.

6th. That a channeled bar can be made having half the weight and one-third less depth than a flat bar, that will have the same fibre stress from centrifugal force.

J. B. JOHNSON.

Driver Brakes.

NO. 34 WALL ST., NEW YORK, Sept. 14, 1887.

TO THE EDITOR OF THE RAILROAD GAZETTE :

I notice your article in last week's issue upon "Air Brake Failures," and the defense that you make of the air brake *per se*, which seems to me to be eminently just and proper, for there can be no doubt but that the automatic air brake as at present applied to our passenger coaches, is by far the best device of its kind that has been invented; still it has occurred to me that the use of driver brakes upon passenger engines has not become as general as it should. Certainly the ponderous machine at the head of the train should invariably be provided with a braking force upon its wheels which shall be adequate to arresting its own momentum, and ought not to

be dependent upon the brake on the coaches for stopping power.

It is a fact, however, that a very large number of roads in the country do not employ driver brakes upon their engines, and object to their use upon the old idea that they wear the tires unnecessarily, and are apt to damage parts of the machine, preferring to rely upon the reverse lever in an emergency. Progressive railroad managers are relinquishing such a theory rapidly, and are satisfied that brakes upon all the wheels of the train are a necessity.

The use of a steam driver and tender brake upon the engine in conjunction with the air brake upon the cars of the train seems to be the latest improvement that has found favor, and quite a number of roads are adopting it, for the reason that should the supply of air fail from any cause, or a careless employé neglect to turn a cock or make a coupling, the engineer will always be provided with one brake at least upon his engine, which cannot fail while there is steam pressure in the boiler. Steam brakes upon the coaches have been tried and found worthless, but the steam brake upon the engine and tender wheels is a success.

I am advised by good authority that in the case of the accident at St. Thomas, upon the Grand Trunk Railway, which you mention, there was no driver brake upon that engine. Had there been, the failure of the crew to open the air cock and permit the air pressure to go through the train would not have caused such serious results. Experience is teaching us that where safety to human life is involved, the wise manager will not neglect to avail himself of every improvement which human ingenuity can suggest to protect the traveling public; and I am certainly of the opinion that it is unsafe to rely entirely upon all occasions on any one system of braking, and that the combination of air brake upon the cars with a good steam brake upon the engine, may provide against disaster in certain contingencies. It is an easy matter to overcome the objection which is raised to the operation of separate valves by the engineer for each kind of brake, as by a very simple arrangement both brakes can be applied by moving the same valve handle. EDWARD VERNON.

Preservation of Timber.

NEW YORK, Sept. 13, 1887.

TO THE EDITOR OF THE RAILROAD GAZETTE:

It is gratifying to those who are interested in the important subject of wood preservation to observe that the technical papers connected with the railroad and kindred interests are more frequently publishing letters and articles on this subject. The importance of some effective and cheap method of timber preservation cannot be over-estimated, and facts and figures relating to the magnitude of the saving which would be effected by the general adoption of such a method have been too often published to need repetition.

I believe it is generally conceded by railroad men, and others interested in timber preservation, that the only obstacle in the way of the general use of some wood preserving material and process is the uncertainty which has heretofore existed as to the best preservative substance or compound for general use.

After this essential point, *i. e.*, the selection of the proper preservative, has been settled, the mechanical portion of the process is comparatively easy, as there are a multitude of devices now recorded in the Patent Office from which may be selected at least a dozen which will perform satisfactorily the mechanical part of the work, the majority of them having been fully tested by actual work, and although many failures have been the result of their use, yet it is generally acknowledged by experts that these failures have been more the result of imperfect preparation of the wood through greed or want of knowledge on the part of those who have contracted to do the work, and the use of an improper preservative than any inherent defect in the mechanical device.

The mechanical part of the work of timber preservation is, in fact, when stripped of the multitude of devices which patentees have resorted to for the purpose of evading previous patents, quite simple; it consists first, in the drying of the timber to be treated; and, second, in the injection into the wood by pressure of a sufficient quantity of the preservative material. If we assume that some proper mechanical device has been selected by which the above conditions may be fulfilled, then the very important point of the proper preservative material to be used presents itself.

In order to decide intelligently as to which of the great number of compounds which have from time to time been proposed for this purpose is most suitable it becomes necessary to examine somewhat minutely the cause of the decay of wood. It was formerly the opinion of many that the decay of wood was caused by some chemical process by which the elements of the wood were resolved by the action of water and the atmosphere into new combinations, but since the researches of Pasteur and others have placed the germ theory on a firm footing it is now generally acknowledged that decay is merely the result of the action of organisms which feed upon the wood and destroy it whenever it is subject to conditions favorable to their action; hence it is necessary in the first place to select some substance for the treatment of the wood which shall prove fatal to such organisms, or in other words, a germicide. Many metallic salts, the most effective and powerful of which is the bi-chloride of mercury, accomplish this purpose fully, and some of them are so cheap as to have led to their adoption on a large scale; but unfortunately they have all proved failures when the wood has been placed in any position exposed to the action of water, whereby these metallic salts have been dissolved and washed out, leaving the wood as much exposed to the attacks of germs as if no preservative treatment had been used.

It therefore becomes necessary where such metallic salts are used to supplement the treatment by filling the outer pores of the wood with some waterproof substance, in order to prevent the washing out of the germicide. This necessitates two treatments and complicates and renders the process more expensive, and consequently we are compelled to select some substance which shall combine the two qualities, or which shall be capable of not only acting as a powerful germicide, but at the same time of rendering the wood waterproof.

I believe that fernoline fulfills these conditions. This is a compound of true wood creosote, heavy tar oils and paraffin. The first of these, wood creosote, is one of the most powerful germicides in existence, exhaustive investigation having determined its power to destroy all germs, even when diluted to the extent of ninety-seven parts of water to one part of creosote. The paraffin is perfectly insoluble in water, and, as its name implies, is unaffected by nearly every chemical substance. The heavy tar oils hold the creosote and paraffin in solution and permit of its easy access to the pores of the wood; in fact, it is found that even when applied to the surface of the wood with a brush it penetrates the wood to a considerable depth, especially in the case of the soft and sap wood. After remaining in the wood a short time the compound hardens or solidifies into a waxy substance, which fills all its pores and renders it wholly impervious to the attacks of all germs, boring insects and sea worms.

The uses of fernoline have been so fully demonstrated that several large corporations have adopted it, and its use has been recommended to the United States Government by a board of engineers convened to make an examination of it. Its qualities as a wood preservative combine the offices of germicide, and that of a protector against the entrance of water, and at the same time its composition as an oil renders it capable of easily entering the pores of the wood. X.

[Our readers will remember that the process adopted by the Chicago Tie Preserving Co., whose works and method of treatment at Laramie were described in the *Railroad Gazette*, Oct. 29, 1886, is that known as the zinc tannin process. A solution of chloride of zinc, with a small percentage of dissolved glue, is first injected, followed by a tannin solution. This process was said to cost about 20 cents a tie. It is to be regretted that our correspondent does not give the cost of treatment by the process of which he writes. The Lehigh Valley Company's works at Perth Amboy use the creosoting process with dead oil of coal tar, a process not patented. The fernoline process probably has the advantage of introducing more creosote than the pure "dead oil" process; but the further advantage claimed in the use of paraffine may be a very valuable modification. In the *Railroad Gazette*, Aug. 5, 1887, was published an extract from a paper by Mr. J. P. Card, of Chicago, explaining the process used by him. Dead oil is first injected, followed by a solution of chloride of zinc, the theory being that the latter solution would pass through the former, and penetrate the interior of the wood. By this process he expects to save a considerable part of the dead oil.]

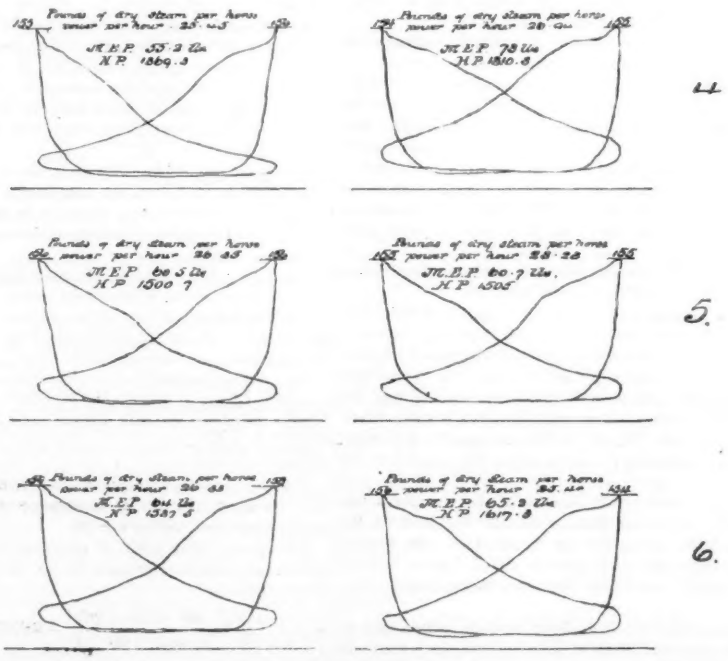
Tests of the Strong Locomotive on the Lehigh Valley Railroad.

The report of Mr. E. D. Leavitt, Jr., transmitting to the President of the Strong Locomotive Co. the report of Mr. J. S. Coon, is at hand. Mr. Leavitt's report is dated Aug. 26, and that of Mr. Coon Aug. 22. We take pleasure in presenting pretty copious extracts from those documents. The first extracts are from Mr. Leavitt's report:

I herewith transmit sundry reports of Mr. J. S. Coon, who was selected to make complete tests of the Strong Locomotives, Nos. 383 and 444, on the Lehigh Valley Railroad, in April and May of the present year; also of the Lehigh Valley engine No. 357, for purposes of comparison with the others, said engine being a first-class example of the best American type of heavy passenger engines. The object of these tests was to determine the economy and general efficiency of the improvements of Mr. Strong, the same being principally in the boiler and valve gear. Mr. Coon's report is so full and exhaustive that it is hardly necessary for me to repeat its details; hence my remarks will be confined to some general observations concerning the probable durability of the improved parts and the necessity which has called them into being.

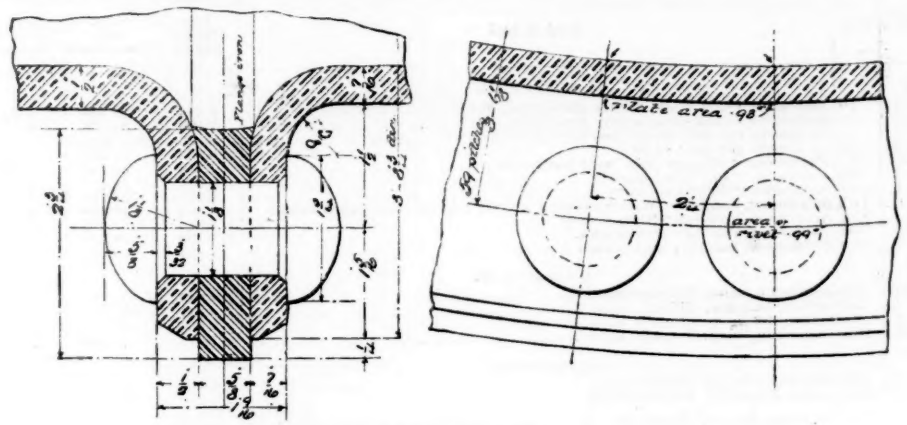
It is well known that the increased weight and speed of trains on our best lines of railway has taxed to the utmost the capacity of the heaviest locomotives in use. * * * Increasing the weight and cylinder capacity of passenger engines has failed to correct the evil of lost time. * * * Mr. Strong saw clearly the weak points of the standard locomotive. These were the boiler and the valve gear; the former was limited in grate area and heating surface; the latter gagged the steam both in entering and leaving the cylinder. To be sure the short slide valve and the link are elegant in their simplicity, but this is all that can be said for them. It has long been known by constructors of stationary engines that four valves were necessary in an engine which should work with maximum economy and efficiency, hence the almost universal adoption the world over of the Corliss engine, and the various types which have been an outgrowth from it. In my judgment Mr. Strong's valve gear for the locomotive promises to do what Mr. Corliss has accomplished for stationary engines; it gives a good inlet and a free exhaust, its mechanical details are simple, and with proper construction will be durable and free from derangement. A comparison of the indicator cards taken from engines 383 [Strong] and 444 [Strong] with those from No. 357 [Standard] will readily convince even the most skeptical mind of the superiority of the Strong valve gear. Attention is called in this connection to the small blue print No. 143, showing diagrams taken at a speed of 60 miles an hour, the driving wheels making 326 revolutions per minute, thus giving a piston speed of 1,304 feet per minute. The power of these cards varies from 1,369.3 to 1,810.8 horse-power, an amount which has never been equaled, and perhaps it would be proper to say, approached by any other locomotive. Although there is a falling off in the admission lines, it is no more than is always found under high piston speeds with the best forms of valve gear. In the boiler of engine 444 Mr. Strong has widely departed from previous locomotive practice at the fire-box end; he has discarded stays, and the deep fire-box for corrugated circular furnaces and combustion chambers, whereby he gets a very large grate area and heating surface of the most effective type. It will also be observed that the tube surface in the boiler of engine 444 is greater than the total heating surface of either of its competitors, and that its grate surface exceeds by nearly 60 per cent. that of engine 357, which has a very large grate (for a standard locomotive). The advantages of this extra heating and grate surface are clearly shown by a comparison of the evaporation of the boilers economically considered. Referring to Mr. Coon's report: On May 11, using anthracite lump coal, engine 444 evaporated 51,422 lbs. of water with 6,948 lbs. of coal, which is equal to an evaporation of 7.4 lbs of water to one pound of coal; May 10, locomotive No. 383 [Strong valve gear, but ordinary fire-box and boiler] evaporated 41,734 lbs. of water with 7,217 lbs. of coal, which is equivalent to 5.78 lbs. of water per pound of coal; May 9, engine 357 evaporated 49,112 lbs. of water with 7,914 lbs. of coal, which is equivalent to an evaporation of 6.2 lbs. of water to one of coal. A further inspection shows that on the 28th of April engine No. 444 evaporated 7.91 lbs. of water per pound of coal, which was clean anthracite egg; also that on May 6 the same engine, using bituminous lump coal, evaporated 8.56 lbs. of water per pound of coal. These results show so clearly the superiority of the Strong boiler, that they cannot be gainsaid.

I understand that subsequent to the trials on the Lehigh Valley, the boiler of engine No. 444 developed some weaknesses, which were entirely due to faults of construction, and not to any inherent weakness of design; these leaks were principally in the joint between the fire-boxes and combustion chamber. * * * The plan proposed for future boilers of using the Adamson joint between the fire-boxes and combustion chamber, thus leaving a calking edge, which can always be tightened, seems to promise all that can be desired



Cards from Blue Print, No. 143.

The above cards were taken on the Northern Pacific Railroad on June 24, 1887, while locomotive was pulling 12 cars, 10 8 miles in 11 minutes. Weight of train, exclusive of engine and tender, 370 tons, with engine and tender, 476 tons, which would make the resistance per net ton 31.2 pounds. Boiler pressure was 160 pounds; piston speed, 1,304 feet, or 326 turns per minute.



The Adamson Joint.

in correcting the troubles that have occurred with the present boiler. The form of the Strong boiler is one which possesses great strength, combined with simplicity and accessibility; the absence of stays is a marked and valuable feature. It is well known that in marine boilers corrugated circular furnaces and cylindrical shells have almost entirely displaced boilers with stayed furnaces and shells. With increasing pressures, the limit of which can hardly now be placed, simple, strong details are indispensable, and if the locomotive of the future is to be worked with pressure ranging from 200 to 250 lbs. per square inch, I know of no better boiler to generate and confine it than that of Mr. Strong.

Returning to the valves and valve gear. The gridiron slide valve adopted by Mr. Strong is one which has been used in my own practice for nearly thirty years, and with eminent success No valve that has ever come under my notice is so well adapted for high pressure. None will remain so long tight and require so little attention. This is of the highest importance in an engine claiming to possess a high economy in the use of steam. These valves also are easily moved, and hence do not require balancing devices. They open rapidly with a short travel, and thus permit the use of a light valve gear, the valve gear having comparatively little work to do will not be easily deranged nor require much repair. Mr. Strong's gear appears to me eminently simple, in view of the functions which it is able to perform. It brings practically the best automatic cut-off for service on a locomotive. Cut-off valves have been in disfavor with locomotive engineers, because they were difficult of application, brought heavy strains on the valve gear and finally became more troublesome than useful. These evils do not obtain where the cut-off takes place on the main admission valve. The steel valves in engine No. 444 have not given as good results as the cast iron valves in engine No. 383. My own experience would lead me to expect that such would be the case Referring to the other details of construction of engines Nos 383 and 444, they appear to be excellent and equal to the very best modern practice. Mr. Strong has suggested sundry improvements in future construction, which appear to me to be well considered. The indorsement of so eminent an authority as Mr. Alexander Mitchell, of the Lehigh Valley Railroad, will carry very great weight, and it is both my hope and expectation that the Strong engine will be very generally adopted for both freight and passenger service, as its merits become more fully known and appreciated.

Later on I propose to submit an appendix to this report, in which will be considered more fully the economic evaporation of the boiler of engine No 444 and the efficiency of the valves and valve gear as compared with both those of the ordinary locomotive and of the best automatic cut-off stationary engine.

E. D. LEAVITT, Jr.

CAMBRIDGE, Aug. 26, 1887.

REPORT OF MR. COON.

The object of these tests was to determine the relative efficiency of the Strong locomotive boiler and cylinder and valve gear, and their ease of working and liability to derangement, as compared with the best type of American locomotive in common practice at the present time. To this end three locomotives were tested, viz.: Engine No. 444, fitted with Strong's patent twin furnace boiler, and Strong's patent four valve cylinder and valve gear; Engine No. 383, having an ordinary straight top boiler, with fire-box over instead of between the frames, anthracite coal grates, and fitted with Strong's patent cylinder and valve gear, similar to No. 444; Engine No. 357, having an ordinary boiler, similar to that on engine No. 383, save that it has a "wagon-top" of eight inches, and the link motion common to American practice, with plain slide valves having De Lancey's balancing device.

Some of the leading particulars of the three locomotives are tabulated:

[The Strong locomotive has been pretty fully described in the *Railroad Gazette* of Feb. 5 and March 19, 1886, and Feb 18, 1887, therefore the description is omitted here.]

The boiler of No 444 was constructed at Edgemore, Delaware, but the engine was built at the Wilkesbarre shops of the Lehigh Valley, Mr. Alexander Mitchell Superintendent and Master Mechanic of the Wyoming Division.

Locomotive No. 383 was also constructed at the Wilkesbarre shops. It has the ordinary locomotive fire-box boiler, with straight top, the water-leg resting on top of the frame. The cylinders and valve gear are of the Strong type, similar to those on engine No. 444.

Locomotive No. 357 was built at the Hazleton shops of the Lehigh Valley Railroad, Mr. David Clark, Master Mechanic. It has the ordinary wagon-top fire-box locomotive boiler, and the link-motion valve gear common to American practice, the slide valves having De Lancey's balancing device. This locomotive is a thoroughly first-class job, and represents the highest type of the American express locomotive.

Manner of Conducting the Tests.—All the locomotives were subjected to exactly the same work, under similar conditions. The run was from Wilkesbarre to Mauch Chunk and return, leaving Wilkesbarre at 8:40 a. m. with train No. 3, consisting of five cars, arriving at Mauch Chunk at 10:55 a. m., a distance of about 55 miles. On the return trip, leaving Mauch Chunk at 12 noon, with train No. 2, consisting of 8 cars, arriving at Wilkesbarre at 2:15 p. m., with a stop of 25 minutes for dinner at Glen Summit. This route is a continuous succession of curves as sharp as 14 degrees, and grades as steep as 96 ft. per mile.

The water supplied to the tender on each trip was gauged as follows: On each side of the tender, and at the centre of gravity of the water space, long glass gauges, the height of the tender, were attached, with a blank wooden scale behind. The tender was filled nearly full of water and placed on the track scales, the height of water in the glass gauges being marked on the scale. These were the 0 marks. The water was then drawn off 5 cwt. at a time (560 lbs.) and corresponding marks made on the scale, each division thus representing 560 lbs. of water. The readings of both scales were taken immediately before and after taking water, and at the end of the run. The same tender (that of engine No. 444) was used on all the trials, without alteration.

All the coal for each run was weighed in barrows on a platform scale, and any coal remaining in the tender at the end of the run was deducted from the original amount, it also being weighed. At the beginning of each run, before any coal was charged to the experiment, the engine was allowed to start with a uniformly good fire. No attempt was made to keep track of the coal burned during the night. It was not practicable to get the weight of the ashes. All the anthracite coal burned was from mines in the immediate vicinity of Wilkesbarre.

The boiler pressure was taken at five-minute intervals on each run.

The temperature of the feed water, at the three tanks where water was taken, did not vary half a degree from 64.3 degrees F. throughout the trials.

Engine No. 357 has a boiler feed-pump attached to one cross-head, any deficiency of water being supplied by an injector. Engines Nos. 444 and 383 were supplied with water solely by injectors.

All indicator cards were taken on up-grade, on the outward run from Sugar Notch to Fairview, and on the homeward run from Mauch Chunk to Glen Summit. Two operators took simultaneous cards from each end of both cylinders, while a third operator in the cab noted the corresponding steam pressure, position of throttle lever and reverse lever, and the exact time the cards were taken. The cab observer also noted the exact time of passing the mile posts, and the time of stopping and starting at stations. This latter work was most satisfactorily done by Mr. C. M. Mendenhall, of the Pennsylvania Railroad, throughout all the trials, who also witnessed the weighing of all water and coal.

The indicators were the Tabor, and certainly no disparagement to any other make of indicator is intended when it is stated that the indicators, apparently, were absolute perfection. The indicator rig, for reducing the piston motion for the indicator barrel, was a modified true pantagraph motion, the suggestion of Mr. F. W. Dean, and it was also apparent perfection. The strings used were hard braided linen, about 8 in. long. Cards taken at 60 miles per hour are not more than .03 in. longer than those taken at 1 mile per hour. No shields were used, and not the slightest difficulty was experienced in taking accurate cards at over 60 miles per hour. At speeds much exceeding the latter, wind shields would be a convenience.

Through the courtesy of the Pennsylvania Railroad we had the use of their dynamometer car, under the direction of Mr. S. Porcher, during the latter portion of the trials. With this car we also made a special run with a heavy "consolidation" freight engine, at the request of Mr. Alex. Mitchell, the results of which are not pertinent to the trials of the three other locomotives, except in so far as it showed the character of the pull of the different engines, which was largely in favor of the Strong gear.

Attention is invited to the tables of coal consumed and water evaporated. On the first four trips with engine 444 some journals on the front truck heated, and on the third trip a main crank-pin heated, so that a helper was considered desirable. Subsequently no parts warmed at all, on any of the engines. In the effort to burn bituminous coal our fireman had never had the slightest experience with it. So the runs on April 29 and May 6 were not successful. After the latter it was deemed advisable to let 444 act as helper on the mountain, using soft coal for fuel, until the fireman could hold the steam up, which proficiency be speedily acquired. In this connection it is worthy of note that on May 20, when 444 drew eight cars up the 96-feet grade from Sugar Notch to Glen Summit, the safety valve blew off when nearly up the hill, using soft coal. It is to be observed that 444 made the run successfully on screenings from the coal dump. The Lehigh Valley has no other engine capable of the same service on such fuel. It is further worthy of note that in changing from anthracite to bituminous coal no alteration whatever was made to 444. Either coal can be burned with a double 4-inch exhaust nozzle. The fireman had not become sufficiently expert to prevent the steam blowing off when running down-grade. Not so much blew off on May 19 and on May 18, which makes a difference of 1,700 pounds of water consumed.

While 444 used more water than either of the other engines its consumption of coal, of the same grade, is far below the others, which fact indicates the marked efficiency of the Strong boiler.

On the day of the first run, April 30, made with 383, there was a tremendous head wind on the up grade from Mauch Chunk to Glen Summit, which accounts for the extra consumption of coal and water on that run.

The track was in best condition during the two runs made with No. 357, heavy rains having fallen during both nights previous.

If the consumption of coal of the three locomotives be compared, each on two trips when they were using the same grade of coal, to wit: Locomotive No. 444, on trips No. 4 and No. 10; locomotive No. 383, on trips No. 8 and No. 14, and locomotive No. 357, on trips No. 12 and No. 13, it gives the average for the three respectively, as follows:

Average for engine No. 444	6,537 lbs. coal.
" " " 383	7.441 "
" " " 357	8.087 "

which is a difference of 646 lbs. between Nos. 383 and 357, or an advantage of 8.7 per cent. in favor of engine No 383, and a difference of 1,550 lbs. between Nos. 444 and 357, or an advantage of 23.7 per cent. in favor of No 444. It is also to be borne in mind that engine No. 357 has 2 sq. ft. more grate area and nearly 200 sq. ft. more heating surface, and much better steam room than No. 383. With equal boilers there would be still greater difference in the coal. In support of this, compare the two runs of engine No. 383, on May 2 and May 10, and engine No. 357, on May 7 and May 9, as to water required from Mauch Chunk to Glen Summit, all the way up grade, and no blowing-off took place. On these four runs the load was precisely the same, about 421,600 lbs., besides engine and tender. The mean consumption of water from Mauch Chunk to Glen Summit for the two runs mentioned, for the two engines was:

For No. 383	17,942 lbs.
" " 357	21,585 "

a difference of 3,643 lbs. in favor of No. 383, or 20.3 per cent., which must be attributed solely to the superiority of the Strong valve gear over the best type of link motion.

The only portions of the Lehigh Valley Railroad covered

LEADING PARTICULARS OF THE THREE LOCOMOTIVES.

	Engine 444.	Engine 383.	Engine 357.
Cylinders, etc.			
Cylinder, diameter and stroke	20 in. by 24 in.	19 in. by 24 in.	20¼ by 24 in.
Number of valves per cylinder	4 2 steam, 2 exh.	4. 2 steam, 2 exh.	One
Type of valves	Gridiron	Gridiron	Balanced slide
Number of ports per valve	10	10	
Size of ports	4⅝ in. by ¾ in.		
Full travel of valves	1⅛ in.	1 1/16 in.	
Lap of valves	1/16 in.		
Lead of valves, steam	1/32 in. constant	¼ in. constant	
Lead of valves, exhaust	1/16 in. constant	1/16 in. constant	
Throw of eccentrics	2½ in.		
Tractive force per lb. of mean effective pressure on piston	154 8 lbs.	131.3 lbs.	149.11 lbs.
Cylinder clearance in cubic inches	481	448	568
Cylinder clearance in per cent. of piston displacement	6.38 per cent.	6.58 per cent.	7.35 per cent.
Wheels and Journals.			
Front truck 4-wheeled swing beam	Yes	Yes	Yes
Rear truck 2-wheeled swing and radius bar	Yes	None	None
Nominal diameter of driving wheels	62 in.	66 in.	68 in.
Calipered diameter of driving wheels	62 1/32 in.	65 1/16 in.	66¼ in.
Diameter of front truck wheels	30 in.		
Diameter of rear truck wheels	42 in.		
Total wheel-base of engine	30 ft. 2 in.	22 ft. 9 in.	22 ft. 1 in.
Rigid wheel-base of engine	5 ft. 7 in.	7 ft. 9 in.	7 ft.
Weights, etc.			
Total on drivers, in working order	90,000 lbs.	74,640 lbs.	63 280 lbs.
Weight on front truck, in working order	27,000 lbs.	24,880 lbs.	27.440 lbs.
Weight on rear truck, in working order	21,000 lbs.	None	None
Total weight of engine, in working order	138,000 lbs.	99,520 lbs.	90,720 lbs.
Boilers, etc.			
Height of boiler centre above rail	7 ft. 3 in.		
Kind of boiler	Twin furnace	Straight shell	Wagon top
Diameter of barrel inside smallest ring	58 in.	55 in.	54 in.
Diameter of fire-boxes and combustion chambers, corrugated	38½ in. inside		
Length of grates	42⅝ in. outside	11 ft.	11 ft.
Width of grates		3 ft. 4½ in.	3 ft. 6¾ in.
Number of tubes, all iron	306	229	248
Diameter of tubes, outside	1¾ in.	2 in.	2 in.
Length of tubes	11 ft 5 in.	11 ft 4⅛ in.	12 ft. 2 in.
Grate area, square feet	62 sq. ft.	37.12 sq. ft.	39.2 sq. ft.
Heating surface, fire-box, square feet	155	151.6	142.3
Heating surface combustion chamber, square feet	93		
Heating surface, tubes, square feet	".600	1.234.3	1,429.8
Heating surface, total, square feet	1.848	1.385 9	1.572.1
Ratio of heating surface to grate area	29.8 to 1	37.3 to 1	40.1 to 1
Working steam pressure per square inch	160 los.	160 lbs.	140 lbs.

by the tests, where the locomotives were brought into competition as to speed, are between Sugar Notch and Fairview, going south, where the maximum grade is 96 ft. per mile, and between White Haven and Glen Summit, going north, where the maximum grade is 69 ft. per mile. It is usual, on the trip north, with train No. 2, to have a helper from White Haven to Glen Summit, but none was allowed on the trips whose results are given in the tables. The running time between the stations represent the relative strength and speed of the several engines, as each was expected to make its utmost speed between these points. On other portions of the road any of the engines could much more than make running (schedule) time with the trains handled.

It is an interesting and suggestive fact that engine No. 444 made its fastest runs on these days, May 18, 19 and 20, when it drew the heaviest trains. The reason for this was well understood by all disinterested parties connected with the test.

If the two fastest runs of engines Nos. 383 and 357 between Sugar Notch and Fairview be taken, viz., May 9 and 10, there were nineteen sets of indicator diagrams taken on each of those runs between the points stated. The mean initial boiler (gauge) pressure for the 19 sets of cards is for—

Engine No. 383, May 10, mean boiler pressure..... 159 lbs.
Engine No 357, May 9, mean boiler pressure..... 151 "

If these be multiplied by the tractive force per pound of mean effective pressure on piston of the two engines, viz.:

Engine No. 383, 131.3 × 159.0..... 20,877
Engine No. 357, 149.1 × 151.0..... 22,514

With the same valve gear these products should represent the relative strength and speed of the two engines. In other words, engine No. 357 should have been 7.8 per cent. quicker than engine No. 383. But, on the contrary, engine No. 383 ran from Sugar Notch to Fairview in 22 minutes 39 seconds, and engine No. 357 was 25 minutes 0 seconds making the same distance, with the same load, or 9.4 per cent. slower than engine No. 383. It would seem as though but one inference can be drawn from this, to wit: the marked superiority of the Strong valve gear over the link motion in getting rid of the exhaust steam. In other words it is 9.4 per cent. plus 7.8 per cent. = 17.2 per cent. better in this particular instance.

The tables giving the stops on May 9 and 10 are the same for all other runs, excepting of course the running time between stations. The only exception is the trip of engine No. 444 on May 20, which ran from Sugar Notch to Glen Summit without stopping.

Consumption of Water in Detail (All up grade).

Locomotive 444.

Date.	Trip.	Sugar Notch to Fairview.	Mauch Chunk to Penn Haven Junction.	Penn Haven Junction to Whitehaven.
May 4	9th	9,212 pounds	6,328 pounds	9,492 pounds
" 5	10th	8,778 "	4,354 "	9,464 "
" 11	15th	8,708 "	6,062 "	9,282 "
" 18	16th	10,094 "	5,362 "	8,512 "
" 19	17th	9,548 "	5,250 "	8,848 "

Locomotive 383.

May 2	7th	7,896 pounds	Not taken	Not taken.
" 3	8th	7,896 "	"	"
" 10	14th	7,056 "	4,620 pounds	6,636 pounds

Locomotive 357.

May 7	12th	7,810 pounds	Not taken.	Not taken.
May 9	13th	8,092 "	6,048 pounds	8,638 pounds

Consumption of Water in Detail (All up Grade).

Locomotive No. 444.

Date.	Trip.	Mauch Chunk to White Haven.	White Haven to Glen Summit.	Mauch Chunk to Glen Summit.
May 4	9th	15,820 pounds.	8,320 pounds.	24,140 pounds.
" 5	10th	13,818 "	8,306 "	22,124 "
" 11	15th	15,344 "	8,092 "	23,436 "
" 18	16th	13,874 "	8 232 "	22 106 "
" 19	17th	14,098 "	8,840 "	22,938 "

Locomotive No. 383.

May 2	7th	11,704 pounds.	6 664 pounds.	18,368 pounds.
" 3	8th	11,312 "	6,120 "	17,432 "
" 10	14th	11,256 "	6,360 "	17,516 "

Locomotive No. 357.

May 7	12th	14,000 pounds.	7,224 pounds.	21,224 pounds.
" 9	13th	14,686 "	7,260 "	21,946 "

Locomotive No. 444.—*Special Run.*

May 20th—19th trip—Special run to Glen Summit with eight cars, water, Sugar Notch to Glen Summit, 11,620.

Weight of Trains.

ENGINE No. 444.

Date.	Trip south. Lbs.	Trip north. Lbs.
May 5 and 11 and all previous runs	253,000	421,500
" 18	282,900	451,000
" 19	282,900	451,000
" 20	362,000	None.

ENGINE No. 383.

April 30 and all runs *	253,000	421,500

* Trip north, May 3, 374,300 lbs.

ENGINE No. 357.

May 7 and 9	253,000	421,500

In the following table of steam pressures [means only reprinted here.—ED.] a fair representation is given of the steaming of the several boilers during the time when indicator cards were taken. The steam pressure was taken with every indicator card, but in the following table only about one-third the total observations are recorded. The locomotive gauges were all more or less inaccurate, but in the table all pressures have been corrected to standards of American Steam Gauge Co. and the Ashcroft Manufacturing Co., whose standards agreed. It is to be noted that these pressures are very much in excess of the pressures which the locomotives were nominally working under, and this was through no lack of proper care and precaution on the part of the Lehigh Valley Railroad Co., but through an unfortunate choice of a standard.

COAL CONSUMPTION AND WATER EVAPORATION.

Date.	Trip.	Kind of coal.	Lbs. coal consumed.	Lbs. water evaporated	Lbs. of water per lb. coal.
		Locomotive 444.			
April 25..	1st	Anthracite, mixed sizes; mostly screenings; dirty	8.114	51 940	6.40
" 26..	2d	Anthracite, mixed sizes; mostly screenings; dirty	7.698	52,132	6.77
" 27..	3d	Anthracite, egg size; clean; had hot pin and helper	6,386	Not taken	....
" 28.	4th	Anthracite, egg size; clean	6,562	51.900	7 91
" 29..	5th	Bituminous, "Blacksmith's" wet; had helper	7,216	53 816	7.45
May 4..	9th	Anthracite, "Pea" size; clean	8,002	50,680	6.33
" 5.	10th	Anthracite, "Egg" size; dirty	6,511	50,708	7.78
" 6..	11th	Bituminous, lump size; Westmoreland Company's mines; had helper twice	5,614	48,062	8.56
" 11..	15th	Anthracite, lump size; Hillman mine	6,948	51,422	7.40
" 18..	16th	Bituminous, Barclay; broken sizes	7.530	53,970	7.16
" 19.	17th	Bituminous, Barclay; broken sizes	7,154	52,234	7 30
		Locomotive 383.			
April 30..	6th	Anthracite, lump; Hillman mine	8,643	45,472	5.26
May 2..	7th	Anthracite, lump; Hillman mine	8.311	43,512	5.23
" 3.	8th	Anthracite, lump; Franklin mine	7.666	42.364	5.53
" 10..	14th	Anthracite, lump; Franklin mine	7,217	41,734	5.78
		Locomotive 357.			
May 7..	12th	Anthracite, lump; Franklin mine	8,260	47,824	5.79
" 9..	13th	Anthracite, lump; Franklin mine	7,914	49,112	6.20

INDICATED HORSE-POWER, ETC.

	Running time.	Total revolutions.	Speed, miles per hour.	Indicated horse-power.	Pounds water per I. H. P. per hour...	Pounds coal per I. H. P. per hour.
	Min. Sec.					
Engine No 444, *May* 5.						
Sugar Notch to Fairview	25 06	3,869	28.7	796.84	26.33	3.38
Mauch Chunk to Penn Haven Jc.	15 19	2,726.5	33.1	842.01	.....	.....
Penn Haven Jc. to Whitehaven	24 33	4,815	36 5	744 97	31 05	3.99
Whitehaven to Glen Summit	22 00	3,486	29.5	762.32	29.71	3.82
Mauch Chunk to Glen Summit	61 52	.....	.....	.....	.....	.....
Engine No. 444, *May* 11.						
Sugar Notch to Fairview	25 06	3,869	28 7	807.58	25.77	3.48
Mauch Chunk to Penn Haven Jc	16 18	2.726,5	31.1	750.78	.....	.....
Penn Haven Jc. to Whitehaven	25 40	4,815	34.93	705.04	30.78	4.16
Whitehaven to Glen Summit	22 39	3 486	28.67	783.76	27.35	3 69
Mauch Chunk to Glen Summit	64 37	...	.....	.....	.....	.....
Engine No. 444, *May* 18.						
Sugar Notch to Fairview	24 43	3,869	29.15	926.09	26 46	.....
Mauch Chunk to Penn Haven Jc.	15 56	2.726.5	31.87	780.50	.....	.....
Penn Haven Jc. to Whitehaven	25 51	4,815	34.68	No cards	.....	.....
Whitehaven to Glen Summit	21 00	3,486	30 91	No cards.	... ..	.... ..
Mauch Chunk to Glen Summit	57 47	.....	.....	.....	.....	... ..
Engine No. 444, *May* 19.						
Sugar Notch to Fairview	24 52	3.869	28.97	865.1	26.63	3.65
Mauch Chunk to Penn Haven Jc	16 44	2.726.5	30.34	713.1	. ..	.....
Penn Haven Jc. to Whitehaven	23 05	4,815	38.84	781.9	29.41	4.03
Whitehaven to Glen Summit	19 08	3,486	33.93	990.4	28.0	3.836
Mauch Chunk to Glen Summit	58 57	.....	... ..	.....	.....	... ..
Engine No. 444, *May* 20.						
Sugar Notch to Fairview	25 08	3.869	28.66	934.31	.....	.....
Sugar Notch to Glen Summit	20 35	4,904.5	30.87	901.20	25.89	Not taken.
Engine No. 383, *May* 2.						
Sugar Notch to Fairview	24 10	3,672	29.81	867.23	24.28	4.64
Mauch Chunk to Penn Haven Jc	13 37	2,587	37.29	779.23	.....	.....
Penn Haven Jc. to Whitehaven	22 47	4.570	39 35	796.24	24.42	4.67
Whitehaven to Glen Summit	22 53	3,308	28.37	723.77	24 14	4.61
Engine No. 383, *May* 3.						
Sugar Notch to Fairview (No other cards taken.)	23 13	3.672	31.03	853.53	23 90	4.32
Engine No. 383, *May* 10.						
Sugar Notch to Fairview	22 39	3,672	31.81	876 4	21.33	3.69
Mauch Chunk to Penn Haven Jc	15 27	2,587	32.86	732.3	.....	.....
Penn Haven Jc. to Whitehaven	26 43	4,570	31 56	633.1	25.41	4.39
Whitehaven to Glen Summit	20 19	3,308	31.95	818.0	22.60	3.91
Engine No. 357, *May* 7.						
Sugar Notch to Fairview	27 24	3,655	26.29	No cards.	... ..	.....
Mauch Chunk to Penn Haven Jc	15 40	2,576	32.41	584.27	... ..	.....
Penn Haven Jc. to Whitehaven	25 38	4,549	34.97	674.81	31.75	5.48
Whitehaven to Glen Summit	23 15	3,294	27.92	697.15	26.74	4.62
Engine No. 357, *May* 9.						
Sugar Notch to Fairview	25 00	.....	28.82	764.7	25 40	4.10
Mauch Chunk to Penn Haven Jc	16 52	.....	30.10	636.2	.....	.....
Penn Haven Jc. to Whitehaven	25 16	.....	35.49	647.0	31.70	5.11
Whitehaven to Glen Summit	22 19	.....	29.09	736.7	26.49	4.27

DISTANCES.—Sugar Notch to Fairview, 63,402 ft.; Sugar Notch to Glen Summit, 80 370; Mauch Chunk to Penn Haven Jc., 44,681; Penn Haven Jc. to Whitehaven, 78,900; Whitehaven to Glen Summit, 57,132.

Mean Steam (Gauge) Pressures.

	ENGINE 444. May 5.	May 11.	May 18.	May 19.	May 20.
Sugar Notch to Fairview	148 8	148.3	164.1	159 1	165.8
Mauch Chunk to Glen Summit	159.3	147.3	157.9	154.9	. ...
	ENGINE 383. May 2.	May 3.	May 10.	ENGINE 357. May 7.	May 9.
Sugar Notch to Fairview	155.4	161.1	159.3	147 5	152.1
Mauch Chunk to Glen Summit	160.3	165.6	163.9	148.0	145.4

The Run to St. Paul and on the Northern Pacific.—In an appendix Mr. Coon gives some details of the trip of No. 444 from Jersey City to St. Paul last June.

Left Chicago the same day [Having run in from Fort Wayne.—ED.], June 20, on Chicago, Milwaukee & St. Paul Railroad with train No. 1, due to leave at 3 p. m. Train consisted of 9 cars, 3 of which were Pullmans. Weight of train about 510,000 lbs., besides engine and tender. We were about 20 minutes late after passing the last railroad crossing outside the city limits. We then began to run fast, and had been running at least 5 miles at a very high speed before the time at mile posts was taken. The writer then took the following time, sitting on the buffer beam:

Mile post.	Running time. Seconds.	Mile post.	Running time. Seconds.	Mile post.	Running time. Seconds.
66	..	58	63	50	61
65	60	57	59	49	62
64	60	56	61	48	63
63	60	55	58	47	63
62	60	54	57		2 miles.
	2 miles.	53	60	45	112
60	126	52	59	44	53
59	56	51	60	43	64

Running time for 23 observed miles, 22 minutes 57 seconds. At the 43d-mile post we were ahead of time, after which we ran on schedule time to Milwaukee. The division covered by the preceding time-card is nearly straight, and the inequalities in the time between the several mile posts were perhaps due to the grades, which are constant for only short distances. * * *

The customary "helper" was at St. Paul to help us up the 4 miles of 63 ft. of grade, but, at our request, we drew the 9 cars up alone to Minneapolis. We more than made schedule time up the grade, with the engine cutting off within one notch of the earliest point possible.

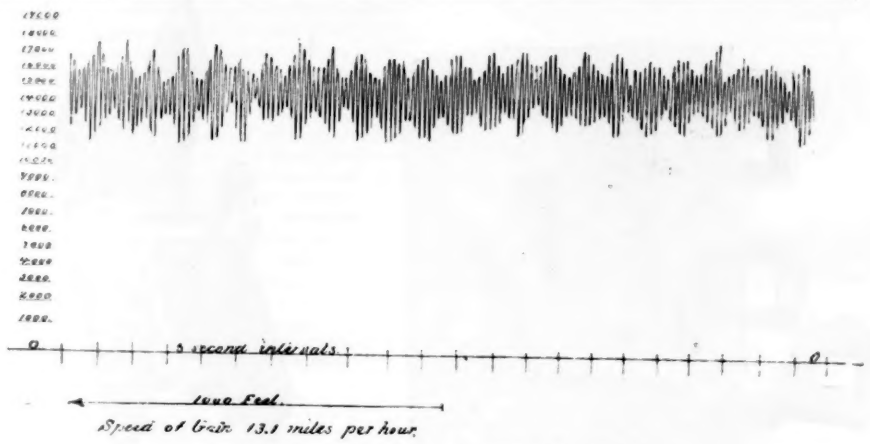
On June 23, engine No. 444 took a train out on the Northern Pacific Railroad to Brainerd, leaving St. Paul at 4 p. m. On this occasion the train consisted of 14 heavily loaded cars, to wit: 1 United States railway post-office car; 1 express car and 1 baggage car, all heavily loaded; 7 full passenger coaches with people standing; 3 Pullman sleepers and 1 dining car. The weight of this train was about 875,000 lbs. Immediately out of the St. Paul station a 3-mile grade is struck, 86 ft. per mile. Our engine easily climbed the hill on schedule time, and when about two-thirds up the grade began blowing off steam. The North Pacific Railroad has a very heavy engine, specially constructed for this grade, weight, 106,000 lbs., but it has never succeeded in making this hill alone, with 9 cars. On this occasion the tractive pull of the engine could not have been less than 23,000 lbs., corresponding to a mean effective steam-pressure of 150 lbs. per square inch. The boiler pressure was 175 lbs. The tractive force due to grade alone, neglecting friction, is over 14,000 lbs.

The Dynagraph Car Diagrams.—It would be out of place to enter into an extended discussion on train resistance in this connection. The extensive experiments now (August, 1887) being conducted by Professor Klein, of Lehigh University, may be looked forward to for valuable data on this point.

* * * On May 20 a train of 30 coal "jimmys" was drawn from Sugar Notch to Fairview (with the dynamometer car attached) by one of the heaviest Lehigh Valley Railroad "consolidation" freight engines. The engine was the "Bee," No. 82, having 20-in. by 26-in. cylinders, and eight-coupled 50-in. drivers, weight of engine, about 114,000 pounds; weight of tender, about 80,000 pounds; weight of train, including dynamometer car, 631,000 pounds, or 281.7 long tons.

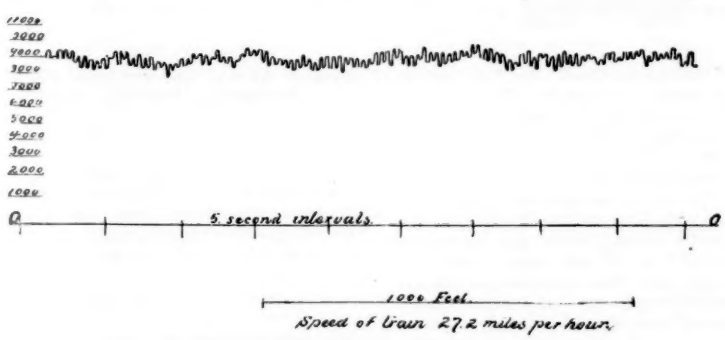
Strain diagram A fairly represents the action of this locomotive. The portion shown was taken on a 96-foot grade and on a 10 degrees curve, and at a speed of 13.1 miles per hour, when the locomotive was working at its best.

Strain diagram B is a portion of that taken on May 20, with engine No. 444, the portion shown being taken at pre



Strain Diagram "A," Locomotive No. 82.

Cylinders, 20 in. × 26 in.; drivers, 50. in. diameter; weight of train, 281.7 long tons; 96-foot grade; 10 degree curve; speed, 13.1 miles per hour; net horse-power, 527.4; net tractive force, 15,097 pounds; tractive force per ton, 53.5 pounds.



Strain Diagram "B," Locomotive No. 444.

Weight of train, 174 long tons; 96 feet grade, 10 degree curve. Speed, 27.2 miles per hour. Indicated horse-power, 952.4; net horse-power, 632.3. Net tractive force, 8,718 pounds; tractive force per ton, 50.1 pounds.

cisely the same portion of the road as diagram A, viz.: on 96 ft. grade and 10 degrees curve, but at a speed of 27.2 miles per hour. As previously stated, the weight of train at this time was 174 tons. The vertical scale for diagrams was furnished to Mr. Porcher, having charge of the dynamometer car.

Nothing could more strikingly represent the action of the steam in these two engines than the strain diagrams. The revolutions of the drivers of engine No. 82 can be accurately taken from the strain diagram, every cusp on either side of the curve representing a revolution.

It is obvious from this diagram (A) that one end of one cylinder was doing more work than the other end of the other cylinder. Hence the great oscillations in the diagram. It is also to be noted that the train, as a whole, had its rate of oscillation about every six or seven revolutions of the drivers. This could easily be detected on the train, independent of the strain diagram.

Speed of trains:

Engine No. 82	13.1 miles per hour
Engine No. 444	27.2 miles per hour

Net tractive force at time diagrams A and B were taken—

	Pounds.
For engine No. 82	15,097
For engine No. 444	8,718

Resistances or tractive force in pounds per long ton—

For engine No. 82 (diagram A)	53.5
For engine No. 444 (diagram B)	50.1

Calculated resistances from Mr. Wear's tables, in pounds per long ton.

	Pounds.
Due to 96-foot grade	40.3
Due to 10-degree curve	11.2
Total due to grade and curve	51.5

The mean of 53.5 and 50.1 is 51.8 pounds, which is substantial evidence of the accuracy of Mr. Wear's tables.

For the above strain diagrams A and B the *net* horse-power due to tractive force of 15,097 lbs. and 8,718 lbs. for the respective speeds are: For engine No. 82, net horse-power, 527.4; for engine No. 444, net horse-power, 632.3; or the net horse-power of engine No. 82 was 83.4 per cent. of net horse-power of engine No. 444.

The indicated horse-power at the time diagram B was taken is as follows: Mean effective pressures in pounds, per square inch—

	P. R. end.	Front end.
Right-hand cylinder	88.64	85 84
Left-hand cylinder	90 21	82 48
Total	178.85	168.32

Indicated horse-power, P R. end	484.3
Indicated horse-power, front end	468.1
Total indicated horse-power	952.4

Horse-power due to traction of No. 444 engine and tender, 952.4 — 632.3 = 320.1. Per cent. which traction of No. 444 engine and tender was of traction of train 50.6 per cent. Per cent. which weight of No. 444 engine and tender was of weight of train 50.0 per cent.

As the weight of train drawn by Engine No. 444 was in part estimated, it is probably not correct within 0.6 per cent. The weight of train drawn by Engine No. 82 was obtained exactly.

Occasion may be taken to offer thanks to the Lehigh Valley Railroad, as represented by Superintendent Alexander Mitchell and his assistants, for their untiring efforts and zeal to make the tests a pleasant success; and to Messrs. C. M. Mendenhall and S. Porcher, of the Pennsylvania Co., for their invaluable co-operation.

J. S. COON.

Wear of Steel Rails.

The author communicates the results of wear of Bessemer steel rails which have been laid for more than twenty years on the Orleans Railway. They were laid in 1864, and have borne the traffic of an average of thirty trains and eight empty engines daily. They are double-headed, and were manufactured at Imphy and Saint-Chamond. There are 675 rails in all, and they have been laid by themselves about the middle of the Etampes incline of 1 in 25, half of them in a straight line and half of them in curves. Two of these rails, chosen from amongst the most worn, were lifted and gauged in October, 1884; and the others in June, 1885, from amongst the least worn. The profiles of the four rails have been compared with the normal section, and samples have been analyzed and tested for temper and tensile strength. In the two most worn rails the reduction of height is nearly the same. The wear has increased from the ends toward the middle by nearly 2 millimetres, or $\frac{1}{12}$ in., tending to show that the ends of the rails partly escaped the pressure and shock of the trains. The fishplates had penetrated the lower heads of the two rails to a depth of $\frac{1}{25}$ millimetre, or $\frac{3}{50}$ in., for Saint-Chamond, and to 3.6 millimetres, or $\frac{1}{7}$ in., for Imphy. The lower heads have been reduced by rust 1 millimetre in width for Saint-Chamond, and 4 millimetres, or $\frac{1}{6}$ in., for Imphy. The upper head of the Saint-Chamond rail has yielded and become enlarged by 2 millimetres, or $\frac{1}{12}$ in. Beside a fringe has been formed at each side of the head, enlarging the width from 2.36 in. to 2.67 in. The Imphy rail is not enlarged.

By analysis it appears that both rails contain a large proportion of carbon, and that they differ only in the proportion of manganese, which is 0.45 per cent. for the Imphy rail, and 0.07 per cent. for the Saint-Chamond. The author concludes that by the yielding of the upper head of the Saint-Chamond rail, the wear is in reality less than that of the Imphy rail, and that the rust which so deeply affected the Imphy rail has facilitated the hold of the fish-plates, and contributed to equalize the wear. Of the two least worn rails, the wear of the Saint-Chamond is nearly the same as that of the first and of all the other rails. But in the second Imphy rail the loss of height is 27 per cent. less than that of the first, the wear at the fish-plates is two-thirds less, and there is only half the corrosion of the lower head by rust. The author concludes, firstly, that the hardest steels, like mild steel, are comparatively inoxidizable; secondly, that of the hard steels the hardest are the best; thirdly, that rail steel, if it is hard, should be of a better quality than that which is defined by a tensile resistance of 45 tons per square inch, the strength of the first Imphy specimen; fourthly, that mild steel is not suitable for double-headed rails of the Orleans profile.—*M. Laillé, in Mémoires de la Société des Ingénieurs Civils (from Iron).*

An Improvement in the Manufacture of Portland Cement.

M. Frederick Ransome, Assoc. I. C. E., read a paper before the "British Association" on this subject.

As at present manufactured, ground chalk or other carbonate of lime is mixed with clay and molded into lumps or balls, technically known as "slurry," varying in weight from 4 to 10 pounds each, which are charged into a kiln with alternate layers of coke, and burned to partial fusion or clinker. The clinker is crushed and ground in an ordinary mill.

The ordinary kiln is charged with 60 or 70 tons of dried slurry and 12 or 15 tons of coke, producing about 30 tons of clinker. The time occupied in charging, burning and drawing a kiln is about 7 days.

The objection to this plan is that the clinker is not uniformly vitrified and wears out the stones very fast. The kiln is large and costly, while the gas evolved requires a high chimney to prevent a nuisance.

Mr. Ransome uses a revolving cylindrical inclined steel furnace lined with fire-bricks, some courses of which are so set as to form fins. The dried slurry is crushed and fed into the upper end of the furnace from a hopper by a pipe, and as the furnace revolves the fins drop the powder through the flame of gas, which may be produced by any gas producer. The operation is continuous, the calcined powder falling from the lower end of the furnace into a conveyor by which it is taken to be cooled before grinding, one furnace turning out 20 tons per day of 24 hours with a consumption of about 3 tons of slack coal.

It is claimed that the powder is neither under burnt nor over burnt, the expense of crushing is avoided, grinding is cheaper and there is a general economy in the first cost, repairs, and all manipulations, with an improvement in the quality of the output from the absence of ashes and the control of either the amount of crushed slurry or of heat applied.

The burning seemed to be satisfactory as shown by the analysis:

	Per cent.
Carbonic acid, anhydrous	0 40
Sulphuric acid, anhydrous	0.26
Silica, soluble	24 68
Silica, insoluble	0 60
Alumina and oxide of iron	10.56
Lime	61 48
Magnesia water and alkali	2 02
	100.00

The tensile breaking strain was:

At 4 days	410	pounds per square inch.
At 6 "	510	" " " "
At 14 "	810	" " " "
At 49 "	900	" " " "
At 76 "	1,040	" " " "

When ground to leave 10 per cent. on a No. 50 sieve, 2,500 holes to the square inch, the weight of the cement was 118 pounds per bushel.

Mr. Ransome claims to have made an excellent cement with a mixture of slag sand from the blast furnaces of the Cleveland iron district, with a proper proportion of chalk or limestone, which, on account of its fusible nature, could not be burned in the ordinary kiln, but in the revolving furnace gave a cement of extraordinary strength and hardness.

The Manchester Ship Canal

The fourth half yearly meeting of this company was held at Manchester on the 29th ult. The directors reported that the contract for the work had been let to Mr. T. Walker for £5,750,000, that the purchase of the Bridgewater Canal and of the Mersey & Irwell navigations had been completed.

The canal is to commence at Eastham Locks on the left bank of the estuary of the Mersey, about half way between Birkenhead and Runcorn, which it skirts for 13¼ miles to Runcorn, where it leaves the Mersey and goes nearly directly to Manchester. The length of the canal is 35.313 miles The quantities as given by *Engineering* are 6,970,815 cubic yards of rock and 37,457,720 yards of earth, or 44,428,535 cubic yards in all; of the rock 1,591,570 cubic yards will be used for lock and river wall work, abutments of railroad bridges, facing slopes of canal, etc.; of the earth 3,603,690 yards are to be used in forming embankments of the canal, 5,176,278 in forming embankments on railroad diversions, 1,555,000 yards will be used in filling what will be the disused bed of the Irwell and other watercourses, 552,000 yards in raising quays and making roads, 800,000 yards to be stacked along the canal banks for future use in maintenance, and the remainder, 31,149,997 cubic yards, is to be wasted.

The amount to be wasted, it will be noticed, is nearly 900,000 cubic yards per mile, and its disposition without either excessive length of haul or prohibitive land damages is a matter for serious study, and arrangements for it have been made so that the longest haul will not exceed half a mile from the canal. Some of the quantities for four locks are estimated as follows:

Cut stone work	918,000 cubic feet
Rough ashlar	4,940 cubic yards.
Brickwork	83,060 " "
Cement concrete	458,000 " "
Excavation for foundations	97,810 " "
Dredging approaches	350,000 " "
Lock gates	108,405 square feet.

There are five deviations of existing railways to be made, which will involve 12½ miles of double-tracked road, and four viaducts across the canal, with 75 feet clear headway to water's level; besides which, 9 swing bridges have been arranged for, to accommodate highways.

As it is necessary to maintain the level of Brindley's old canal, the Bridgewater, and the saving of water is a consideration, the engineer, "Mr. Williams, proposes to make the aqueduct in the form of a swing bridge, which may be opened, swung and closed again without losing any water either from the swinging portion or from the canal."

The completion of this canal, allowing as it will the passage of ocean-going steamers to the heart of Manchester and Salford, cannot fail to cheapen the rates between this city and one of the chief consuming localities of England, besides lessening the very heavy burdens Englishmen pay for internal transportation.

Railways in Tonquin and Burmah.

Engineering republishes a statement from the French *Official Journal* that a special commission has recommended a network of railroads in Tonquin, and then deplores the lethargy "of our own government in regard to the Burmese lines."

It will be remembered that when England deposed the government of Burmah it proposed to immediately connect that country with Siam, China and India. These plans now seem to be quietly shelved, no plans being made for anything more than the line to Mandalay. As this matter is of great interest to the iron trade, our contemporary suggests a little healthy agitation by manufacturers, so that a powerful public feeling may be at the command of those who are in the position to exercise pressure on the government and India office during the next sitting of Parliament. The extreme slowness with which railroads are extended in British crown

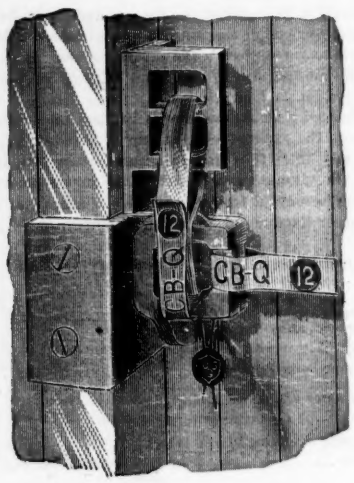


Fig. 1.

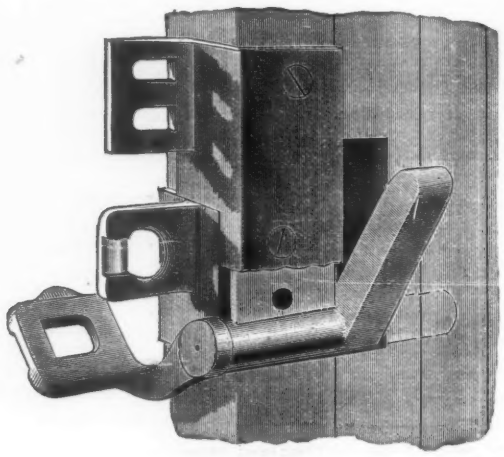


Fig. 2.

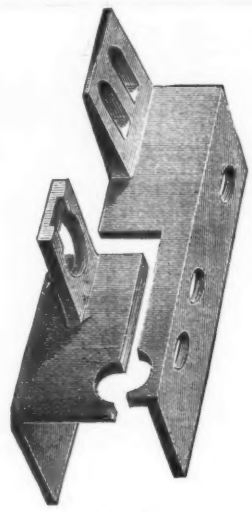


Fig. 3.

BARNARD'S CAR-DOOR LOCK

colonies, despite the higher rate of interest they pay on the capital invested, as contrasted with the comparatively rapid rate at which they are extended in self-governing British colonies, despite the very low rates of interest they pay, is an anomaly which we have never seen explained. The suggestion that crown colonies are not allowed to buy any but English built locomotives does not seem a sufficient reason, though if they adopted American plans of construction and American patterns for their rolling stock much less capital would be required to make the extensions proposed. Manufacturers, however, would not make so much money.

Barnard's Car Door Lock.

The cuts herewith show a form of car door lock as applied to some 600 cars. The lock, it will be seen, is applied on the rear edge of the door, and does away entirely with cleating. Moreover it is contained within the thickness of the door. Both of these features are of considerable value in that they lessen materially the chances of injury to the lock, and save cost of repairs involved in the use of cleats.

Fig. 1 shows a portion of the door and side of car with the lock closed and sealed in three ways. Fig. 2 is the inner side of the lock with a portion of the inner cap broken away to show the position of the locking bolt when half unlocked. Fig. 3 shows the inner and outer caps.

When locked, the locking arm, fig. 2, lies horizontally in front of the rear door post, and when unlocked it is contained in the mortise shown in the door.

The lock is arranged to accommodate three styles of seal:

The tin and lead rivet seal used in a horizontal position, and which requires a seal only three inches long, thereby saving about two-thirds the cost of the tin portion of the seal.

A tin and lead rivet seal used in a vertical position, in cases where cars are on a foreign road not supplied with the short seals.

The wire and lead disk seal, which when used with this lock requires only three inches of wire instead of ten inches, as commonly used. Any kind of tin or wire seal can be used with this lock.

The parts are all of malleable iron and weigh one pound and six ounces. Farticulars may be had of Mr. A. B. Barnard, care of the Ohio & Mississippi Railway Co., Cincinnati, Ohio.

Accident in Soft Ground Work on the Aqueduct

There are several points on the new Croton aqueduct where it has been necessary to tunnel through soft material, generally sand and gravel, with more or less water. The south heading of Shaft 17 had been successfully carried through ground of this character for a short distance, and as far as could be judged the work had no unfavorable aspect. But on the afternoon of the 9th inst. the bench and side walls caved in, allowing the roof timbers to fall. Three men were caught and pinned by beams before they could reach the bricked-up section, and were buried under the inflowing sand and gravel. The earth formed a sloping deposit in the finished work, which at the end was completely filled, with the exception of a small opening at the crown.

The plan by means of which this heading was advanced is known as the "bar" or English method. The excavation is begun at the top, extended along the crown and down the sides, the earth being held by heavy timbers placed longitudinally and braced from each other. Back of these timbers are driven poling strips, so that the entire section is lined with timbers. The face of the heading is carried down at the same time, and is provided with heavy transverse timbers backed with strips similar to those at the sides. The side walls are braced from each other by timbers upon which rest struts supporting the crown bars. The heading is braced from the end of the completed masonry.

In prosecuting this method a drift is started just above the top of the brickwork and extended some distance in advance of the bench. This serves as a base from which all subsequent work is carried on, and also as an explorer for ascertaining the nature of the material ahead. The drift is about 10 ft. wide by 3 ft. in height. It is started by placing a heavy square timber, 10 ft. long, in an opening made at the top of the heading, and supporting it upon three sticks, one at each end and one at the centre. On top of this timber are driven 4-foot strips, which are inclined upward toward their forward ends. After the sides of the excavation have been lined in the same way, another timber is placed under the forward ends of the strips, between which and the timber another row of strips is driven as the first step in extending the second section of the drift. These operations are repeated until the drift has been advanced the required distance, when its heading is protected by plank sheathing securely braced.

The middle crown bar—an oak log measuring from 15 to 20 in. in diameter—is placed with its rear end resting upon the finished brickwork and its forward end upon the drift heading. Upon each side of, and braced from the centre bar, another is inserted. From these bars begins the shingling, as it may be termed, of the section. From the tops of the side bars poling strips are driven with a slight downward inclination, and under their outer ends are inserted other longitudinal bars. Other sets of strips are driven, with a steeper inclination, and other bars inserted until the sides reach below the level of the invert. The bottom of the chamber is covered with one longitudinal and one transverse course of 6-in. planking, which forms the foundation for the tunnel. A cross section through the heading presents a chamber having a more or less irregular outline, the bars of which are not of uniform size, and are not evenly spaced, and which is covered from the roof down each side with courses of overlapping shingles. The irregularity in the outline is of no importance, since the chamber is always made larger than is absolutely necessary to admit the masonry. The work is done little by little, the small openings being protected as they increase in size. Where the material has a tendency to run—having no self-sustaining quality—the excavations as soon as made are lined with hay, against which the planks are placed, the hay serving as calking. The entire space between the aqueduct proper, which is 2 ft. thick, and the walls and roof of the chamber is filled with masonry, thus avoiding the formation of pockets.

The heading that caved in was such as we have described. It was 22 ft. wide, 25 ft. high and 16 ft. long. The section of masonry to have been erected in this was 14 ft. in length. The heading had been cleaned out for the masons who were due at the beginning of the night shift—half an hour. The accident would have resulted, in all probability, in the loss of more lives had it taken place a few minutes later.

There are several very singular points connected with the disaster. As described to the writer, the bench and side walls fell in bodily and at the same instant. The crown bars, having the support removed *only* from their forward ends now rest in a steeply inclined position, and more or less shattered condition. The sand and gravel flowed in so rapidly through the broken walls as almost to bury every man in the heading. There is no indication that the roof fell before or with the walls, but after. The cave came without the slightest warning; there was no straining and cracking of the timbers. That the earth did not gradually flow in, but rushed in with a piston-like effect, is shown by the fact that the blast of air driven out of the shaft was so like a concussion that the men thought it more severe than that produced by blasting.

The surface of the ground over the heading showed no signs of any settlement having taken place. The earth between the heading and surface—something over 100 ft.—must therefore have arched. This is to be regretted, since it renders further operations more difficult and dangerous, as the roof of this pocket is apt to drop at any time, unless, which is not likely, the arch is formed of rock. The ground will be thoroughly explored before further operations are attempted.

The bodies of all the men were found at the invert of the completed work, which is about 3 ft. higher than the bottom of the heading. They had all been caught by falling timbers at that point.

We expect shortly to present an engraving of the heading made from a photograph taken the day before the accident.

Eighteenth Annual Convention of the Master Car & Locomotive Painters' Association.

The first day's proceedings of the Master Car & Locomotive Painters, held at the Grand Central Hotel on Wednesday, the 14th inst., were a little sleepy. Many members of the Association had come from long distances and felt the need of rest before entering upon either work or recreation.

The first session was called to order at 11 A. M., by Vice-President Murphy (in the absence of the President, J. C. Stout), but only to prepare for an afternoon session. The Secretary's report was read, showing a gain of 23 new members during the year, but also a loss of an equal number through resignations and the failure to pay dues. The Association now numbers 98 active and 20 honorary members.

The afternoom session began an hour after time, and by the nomination of Messrs. Barker, Murphy, Sweet and Stines as candidates for president. There was so great a disinclination to accept the office, that after a ballot, it was found necessary to nominate and elect by acclamation a new candidate, Mr. Samuel Brown, of the Old Colony Railroad.

Mr. Brown took the president's chair, and after the election by ballot of Mr. M. W. Stines as first and Mr. J. J. Murphy as second Vice-President, and the unanimous re-election of Mr. Robert McKeon as Secretary and Treasurer, called for the reading of papers. This announcement awoke new interest, but it was of short life. Although interesting remarks were made but two papers were ready, of the eight which the portion of the programme covered appeared to demand.

Subjects Discussed.—Does the addition of japan to raw linseed oil retard its drying if used in excessive quantities, and what variation is there in the drying qualities of japans when mixed with raw oil?

Mr. Stines, of the Barney & Smith Manufacturing Co., Dayton, O., had been unable to prepare a paper, owing to ill health, but gave the results of his experience. He believed that more good japan was spoiled by the addition of too much oil than good oil spoiled by an excess of japan. Oil is not now an important factor in coach painting. No doubt linseed oil without much japan is more durable in out of door painting, but circumstances demand that the drying shall be hastened and the japan used. Some persons claimed that more than one part of the japan to 12 parts of oil is injurious to durability, but more than this proportion may be required in damp weather. Mr. Stines preferred boiled oil for freight cars and exposed work.

Mr. R. W. Scott, of the Delaware Car Works, Wilmington, Del., followed with a paper upon the same question. Mr. Scott regarded the subject as an important one, but there was difficulty in discussing it, since one japan was quite unlike another. His own experience indicated the superiority of a japan made with a single drier. Oil in drying oxidizes and hardens; but to over-oxidize it is to destroy the paint. He had found that japans composed of various driers continued to act upon and destroy the oil after it had hardened. The same result was produced by an excess of japan, and from both causes the oil tended to crumble, and the layer of paint could be rubbed off with the hand after it had attained some age. Ship work tested a paint severely, and experience in it had shown that an excess of japan lessens durability.

Mr. Scott's paper gave rise to considerable discussion, which brought in some new questions of interest. The standard proportions of the Pennsylvania Railroad shops are 9 parts of oil to 1 of japan, and in repainting old locomotive tanks this amount of drier had been found sufficient. When applied to new tanks, however, the same result did not follow. What was the cause of the difference?

In answer, one speaker suggested that if the new tanks had been scoured with stone and washed with turpentine, no trouble would have been experienced, if a proper primer had been used.

The general opinion seemed to be that boiled oil was the best for freight cars, and a member from the far West asked: Why not also for coach work? The wood used on the Pacific coast was redwood, and he had always applied boiled oil to it without rusting difficulty, blistering or other trouble. He did not use japan with it, unless in winter, when damp weather prevailed.

Mr. Stines asked if there was not an increasing tendency on the part of every member to use less oil and more turpentine and japan. Nobody, however, appeared willing to confess. It was evident, however, that the opinion prevailed that japan was a necessity, although it lessened the durability of the paint layer.

The second question for discussion was much like the first, and called forth similar opinions, but no experimental evidence. Mr. Stines summed up the situation in his usual happy manner by saying that, while all had their opinions, it was evident that no one was prepared to answer the questions.

An invitation was received from the Western Painters and Decorators' Association of New York to a reception at their rooms, and the Association adjourned to attend it.

ACTIVE MEMBERS IN ATTENDANCE.

M. W. Stines, Barney & Smith Manufacturing Co.
John H. Will, New York Central & Hudson River.
Robert McKeon, New York, Pennsylvania & Ohio.
Jos. J. Murphy, Louisville & Nashville.
Samuel Brown, Old Colony.
E. Hartsborn, Maine Central.
E. F. Joslyn, Lehigh Valley.
F. M. Widner, New York, Lake Erie & Western.
E. L. Felting, New York & New England.
Alex. Campbell, Manhattan Elevated.
E. J. Aubry, Chicago & West Michigan.
Wm. Lewis, Grand Trunk.
M. L. Sims, East Tennessee, Virginia & Georgia.
G. H. Worrall, Eastern.
B. B. Hodges, Wilmington, Columbia & Augusta.
Warner Bailey, Concord.
Geo. W. L rd, Fitchburg.
W. T. Ledford, Richmond & Danville.
R. W. Scott, Delaware Car Works.
C. C. Wood, Pennsylvania & New York.
F. N. Le Ross, Buffalo, Rochester & Pittsburgh.
A. E. Barker, Chicago & Northwestern.
A. E. Lensenbach, St. Charles Car Works.
L. W. Smith, Cleveland & Pittsburgh.
W. H. Martindale, Lehigh Valley.
J. Hoesly, Pennsylvania.
J. H. Rohrer, Toledo, St. Louis, & Kansas City.
H. W. Walton, Providence & Worcester.
H. L. Libby, Cambridge Street Ry.
W. R. McMasters, Wabash, St. Louis and Pacific.
Eugene Lainz, Northern Central.
A. S. Coleman, Intercolonial.
W. C. Fitch, Southern Pacific (Pacific System).
H. G. McMasters, Indianapolis, Decatur & Springfield.
Jno. Hankey, Boston & Providence.
F. F. Fisk, Scioto Valley.
A. Latsch, Illinois Central.
B. F. Murphy, Wilmington & Weldon.
A. R. Given, West Shore.
A. Hunnicke, Missouri Pacific.
Jno. McMurtey, Pittsburgh Locomotive & Car Works.
F. W. Horn, New York, Pennsylvania & Ohio.
Edw. A. Cole, New York, Chicago & St. Louis.

Mitchell's Switch Lock.

The two cuts above represent an ingenious safety switch lock, the invention of Mr. F. S. Mitchell, of the Mechanical Department, Union Pacific Railway, Pocatello, Idaho.

The lock is very simple, consisting of but five pieces, and these are all positive in action. The first cost of the lock is but little, and the parts are so strong that they will outlast the switch itself.

But the main peculiarity of the invention is that it is so

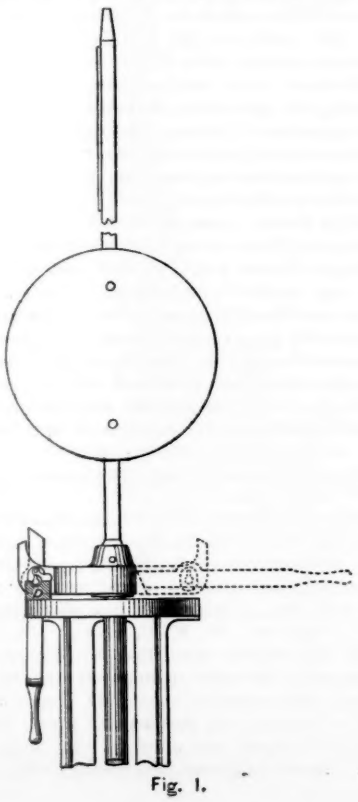


Fig. 1.

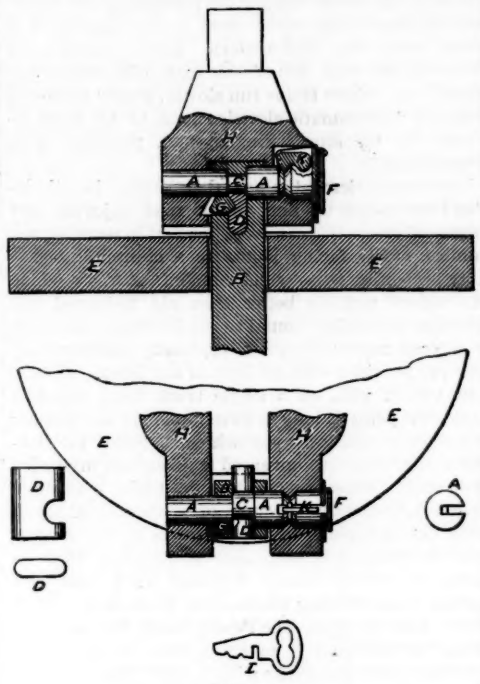


Fig. 2.
Mitchell's Switch Lock.

arranged that the key cannot be removed unless the switch is locked; and, if desired, the lock can be adjusted for a main line switch only, so that the key can be removed only when the switch is locked for main line.

The lock is adapted to any circular switch stand, as shown in fig. 1. Fig. 2 shows the lock in detail, the operation of which is as follows: The pin *A*, on which the lever *B* turns, has a cam formed in the central part, where it passes through the lever at *C*. This cam moves bolt *D* over the switch plate *E* when the lever is down and key is turned, as shown in fig. 1, thereby locking the switch. A flat steel key, made to fit the guard at *F*, turns the bolt back, unlocking the switch and allowing the lever to be raised and turned to the dotted lines shown in fig. 1, when the key cannot be removed until the switch is locked again. A small tumbler *K* is made to drop into the keyhole when the key is removed. The key guard is riveted to the arm *H*, and is cut so as to allow the key to turn in the ward marked *I*. The arm *H* has a recess cut away to allow the small pin *G* to work back so that the bolt *D* will move to the position shown when locked. After unlocking the switch raising the lever causes the steel pin *G* to slide into the bolt *D*, locking both bolt and key, so that the key cannot be removed until the lever is thrown down and the switch is locked.

TECHNICAL.

Locomotive Building.

The Strong Locomotive Co. is now building three locomotives of the Strong pattern for the Atchison, Topeka & Santa Fe. One of these engines will have 19 × 26 in. cylinders and three pairs of drivers; the other two will have 18 × 24 in. cylinders and four 68-in. drivers. A locomotive for the Michigan Central is also under way; it will have 18 × 24 in. cylinders, and is to run on fast trains between Chicago and Detroit.

The Bridgeport, Conn., Malleable Iron Co., one of the largest in the world, will immediately double the capacity of their plant.

The rolling-mill plant of W. H. Everson & Co., at Scottdale, Pa., will be sold on Sept. 20.

The Steelton (Pa.) *Reporter*, of Sept. 10, says: "Never in the history of the Pennsylvania Steel Co. have their works been more crowded with orders than at the present time. Should no accident occur the month of September will show the largest production of steel on record. Both Bessemers have been doing well all the week—No. 1 being above the average production. Both furnaces of the open hearth are in splendid working condition, and were on special steel all the week. Two cranks were cast this week, and molds are now being prepared for the casting of a walking-beam which will weigh about 10 tons. It will be the first one cast of steel at the works. The molds will be ready next week."

Manufacturing and Business.

W. D. Gatchell has received the contract to build an addition 30 × 90 ft. to the car wheel works of Noble Bros., Anniston, Ala. Some new machinery will be put in it.

The announcement was made on the 8th inst. of the failure of Kraft, Goss & Co., and the Illinois Wire Fence Co., Joliet, Ill. Both concerns were operated by the same proprietors.

The Zschoch & McLain Machine Works of Logan, O., and the Hudnut Machine Company of Big Rapids, Mich., are to be removed to Findlay, O., and merged together. They will manufacture saw-mills, steam engines and mill machinery.

The American Railway Equipment Co. has been organized at Atlanta, Ga., with John A. Filton, President, and Hugh Gordon, Secretary and Treasurer.

The Hinson Automatic Car Coupler was given a trial in the Chicago, Rock Island & Pacific yards at Des Moines, Ia., last week, and proved highly successful. Several of the Rock Island cars have been equipped with it. It is the property of the Hinson Automatic Car Coupling Co., of Des Moines, Ia.

The Norfolk & Western has 10 of its cars lighted by the Frost dry carburetter, manufactured by the Railway Lighting & Heating Co., of Philadelphia. An additional order for 10 more cars has been given. Two new parlor cars of the Pennsylvania are now being fitted with these lights, and six of them have been placed in the new car of Second Vice-President Thomson. The company is also filling an order for a lot of new coaches for the Pennsylvania.

Among the recent engines built by William A. Harris, of Providence, R. I., manufacturer of the Harris-Corliss engine, are the following: C. E. Graham, Asheville, N. C., 150 horse-power; Starr Mills, Middleboro, Mass., 150 horse-power; Westmoreland Paper Co., West Newton, Pa., 150 horse-power; Dverville Co., compound condensing, Providence, R. I., 300 horse-power; Clarke Fall Co., North Stonington, Conn., 50 horse-power; *Saturday Globe*, Utica, N. Y., 40 horse-power; Bridgeport Crucible Co., Bridgeport, Conn., 50 horse-power; Glen Manufacturing Co., two engines, Berlin Falls, N. H., 50 horse-power; D. H. Scoville, Higganum, Conn., 100 horse-power; Loraine Manufacturing Co., Saylesville, R. I., 200 horse-power; Taunton Copper Manufacturing Co., Taunton, Mass., 100 horse-power; New York Feed Co., New York, N. Y., 60 horse-power; Thorndike Co., Thorndike, Mass., 200 horse-power; Laconia Co., Biddeford, Me., 300 horse-power; Horace Inman, Amsterdam, N. Y., 100 horse-power; Hale & Frost Manufacturing Co., Hinsdale, N. H., 200 horse power; J. P. Campbell & Co., Providence, R. I., 150 horse-power; Randelman Manufacturing Co., Randelman, N. C., 50 horse-power; New Haven Folding Chair Co., New Haven, Conn, 100 horse-power; Piedmont Manufacturing Co., Piedmont, S. C., 200 horse-power; Fort Mill Manufacturing Co., Fort Mill, S. C., 50 horse-power; Bausch & Lomb Optical Co, Rochester, N. Y, 300 horse-power; Warner Brothers, Bridgeport, Conn., 60 horse-power; Washburn & Moen Manufacturing Co., Worcester, Mass., 150 horse-power; Winona Paper Co., Holyoke, Mass., 50 horse power.

An order has been given by the Duluth, South Shore & Atlantic to have 15 Mogul engines fitted with the American Brake Co.'s driver brake.

The Citizen's Street Railroad Co. of St. Louis has given Johnson, Holland & Co. the contract for lighting two of its new cable cars by means of accumulators.

The foundry and machine shop of Ives & Son, at Decatur, Ala., were opened Sept. 1. The main building of the machine and foundry works is 280 ft. long by 180 ft. wide.

D. E. Garrison & Co., of St. Louis, have just sold 6,000 tons of steel rails, together with the necessary fastenings, to a Western road.

William Taylor & Sons, proprietors of the Columbia Iron Works, Brooklyn, N. Y., report their foundry as full of orders. They manufacture hydrostatic presses and general machinery.

A. Pinder, D. T. Parker, John B. Reese, D. H. Gugar and others have formed the Anniston Machine Co., capital stock $30,000, to manufacture at Anniston, Ala., all kinds of machinery. Will soon build works.

The East Birmingham Iron Roofing & Corrugating Co. will reorganize as the East Birmingham Iron & Steel Corrugating Co., and increase their capital stock to $1,000,000, for the purpose of erecting a rolling mill with a capacity of from 80 to 100 tons at Birmingham, Ala.

The Train Telegraph.

The illustration on this page shows one of the operators of the Consolidated Railway Telegraph Co. on his trip in

a train of the Lehigh Valley road. As stated in the account of this system given in the *Railroad Gazette* of July 22, the "telegraph office" of these trains is in the parlor car (as shown in the cut), though it would seem that the proper place for it, the same as for a dining car, would be *between* the parlor and the ordinary cars, so as to be equally accessible to first-class passengers and to those who are a notch above that democratic grade. If the business proves sufficiently remunerative, an apartment should be partitioned off, say in the ordinary car nearest the parlor cars, and in its contiguous end. A curtain partition would be better than nothing; and something of the sort certainly should be provided, for otherwise the operator would sometimes find it inconvenient to conform to the rule requiring all messages to be kept from the gaze of rude bystanders. A first-class seat among the gentle, brave and wealthy people who ride in parlor cars is agreeable to the operator no doubt, but if the gentle ones should happen to outnumber the "brave," his mind might be distracted from business; and if the company were to employ such attractive operators as grace some of the telegraph offices on shore the disturbance of business might be still more serious.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The official report of "Railway Statistics of Canada," for the year ending June 30, 1886, is before us. The total miles constructed were 11,523; under construction, 751; miles operated, 10,697. The total paid-up capital was $653,376,144, or $61,080 per mile of road. Of this, $156,904,440, or 24 per cent., was government and municipal loans, bonuses, etc. The share capital and bonded debt per mile of road was $45,500. On the railroads of the United States the sum of the same items was nearly $59,000 per mile. The cost per mile of road and equipment was $52,108, and in the United States it was $54,203. The earnings for the year were $33,389,382, the operating expenses $24,177,582, and the net earnings $9,211,800. The operating expenses were therefore about 66.5 per cent. of the gross receipts. In the United States they were 63.8 per cent. The net earnings amounted to about 5.4 per cent. of the bonded debt, which is slightly less than the average interest, leaving nothing for the stock or interest-bearing loans not bonded. The net earnings per mile for five years have been:

	1886.	1885.	1884.	1883.	1882.
United States.....	$2,376	$2,185	$2,318	$2,702	$2,670
Canada...	861	809	820	1,090	880

Yet the Canadian system goes on increasing in more rapid ratio than that of the United States. The increased mileage of the United States system from 1882 to 1886 was 16.7 per cent., while that of Canada was 42 per cent. In the last two years the increase in the Canadian railroad mileage has been about 5 per cent. each year, and in the United States it has been 2 per cent. and 4.6 per cent., respectively. Of course no such increase would have been possible by private enterprise; and it is only when we realize that nearly one-quarter of the total capital of the Canadian roads has been given or loaned by various governments that we can comprehend how they have got themselves built and how they escape bankruptcy; for the above showing of average net earnings per mile, is not a just representation of the income of the roads. The average net earnings of the 10,697 miles operated were $861 per mile; but those of the Canada Southern were $3,290, of the Grand Trunk $1,470, and of the Canadian Pacific, for the same fiscal year, $890. No less than 11 lines, with nearly 15 per cent. of the total mileage, were operated at a loss. Much the greater part of this losing mileage, in fact, 85 per cent. of it, lies in the country east of the St. Lawrence; and of the paid up capital of nearly 62 million dollars invested in these most unprofitable lines, about 52 millions has been paid in by the governments, either Dominion, Provincial or municipal, in one form or another.

The Boston & Albany now has every station between Boston and Springfield, with the exception of Worcester, where alterations are in progress, and one other where few stops are made, equipped with station block signals for the stopping of trains from both directions. There are 35 of the Union track-circuit station-block signals between Springfield and Albany covering the more dangerous portions of the track, and the total for the whole road is 170 signals, 26 of which are of the Hall pattern. Every facing-point switch on the main line of this road, with the exception of two, where trains run slowly, is now protected either by an automatic electric signal, or by being included in an interlocking system, provided with distant signals.

The human element is one that cannot be eliminated from switch tending, and no road enjoying any degree of prosperity can work too fast in reducing the number of its facing points to a minimum, and in fully protecting those which remain. A road which can afford nothing better than old fashioned stub switches is certainly bound to run its trains over them at a very moderate speed, especially when at night they are provided with no light of any kind. Even a split switch will, on a single track road, remain a dangerous point as long as switch tenders are human; and allowing trains to approach such (from the dangerous direction) at high speed is a certain invitation to disaster. Where this is done at night with small switch-lights near the ground, or with none at all as is the case in some places, recklessness is the mildest term the public will deem appropriate when their attention is called to a case. A double track road with trailing-point switches would seem to be about perfection in this direction. The Pennsylvania has such confidence in these that it mantains numbers of them in the main passenger tracks with no light whatever, and some even without a target. This is a point worthy of consideration, for the expense of maintaining and attending a dozen or a hundred lamps is not so small as to be beneath notice. Every cent that can be saved on trailing-point switches can be profitably expended in protecting facing points.

The District of Columbia Commissioners tell the Baltimore & Ohio that its Y track (which, by the way, is not a Y but merely a connection between the two upper ends of one) at the junction of the Washington and Metropolitan branches, must either be restricted to freight traffic or else torn up. Ordering passenger trains to keep off would seem to be only a partial remedy, if indeed it can be called a remedy at all, for the dangers which it is desired to guard against. In will be remembered, from the map and description published in the *Railroad Gazette* of Aug. 26, that the track in question is at the foot of a long and steep grade, and that the accident upon it was caused by trains getting beyond control on the grade and running around the sharp curve at too high a speed. This, we believe, was also the cause of at least one of the other mishaps which have taken place there. Now, it is of course not intended to discontinue passenger trains on the Metropolitan Branch, and they must, of course, continue to come down this same grade, the only change being that the switches must always be set for the straight line. But 60 miles an hour, or 40, or even 20, is a high speed for a train to run in a city street, and moreover the enginemen of all trains should approach such such a junction with their trains well in hand, whichever track they are to travel on. A freight train might take a notion to "run away" down this grade; and passenger trains behind time and under various other circumstances might approach the Y when the switch was set for the curve, so that the attempt to provide a radical remedy ought to be made in the direction of controlling the speed of all trains. The commissioners doubtless look only to the safety of passengers, but a freight train could demolish a building as quickly as the passenger train did, and the danger to pedestrians or others in the street would be just as great. If passenger trains were to be prohibited from using any track that would not admit of their covering a mile of it in a minute, thousands of them would have to discontinue their trips; and if the lower ends of grades must always have a straightaway course like a toboggan slide, a number of railroads will have to be rebuilt.

The effect of lightning on electrical apparatus of all sorts is a subject on which accurate data seem rather scarce, and its effect on railroad signals especially is a point on which more light is needed. A cardinal principle in signals which are in any degree automatic is that they shall show danger in the event of any derangement, and numberless ingenious devices have been invented to provide against the possibility of a signal standing at safety when it has not been intelligently put in that position; but lightning is such a lawless element and may influence electrical apparatus in so many different ways that the counteracting of the harm it may do is not an easy task. It may make a ground connection and thus allow a circuit to appear all right when it is not, being closed at one end and open (without battery) at the other. It may melt fixtures so as to permanently hold a signal in the position it is in at the moment; and again it may charge a wire with a current that will actuate the electro-magnets and work the signals when the signalman has taken no action whatever. While the chances of a signal being held any length of time in the safety position from the effects of lightning alone are very small, and while it is probable that nearly or quite all danger in this respect can be guarded against by cautionary instructions to the attendants, it is nevertheless well to make note of all peculiarities noticed, that experience may be compared. In a recent thunder-storm at Palmer, Mass., the electric locks on the interlocking machine at the crossing of the Boston & Albany and New London Northern were alternately locked and unlocked several times by atmospheric electricity in the rails at and near the crossing. The storm also showed one of the disadvantages of underground wires. A lightning shock generally runs along a wire until it encounters more than ordinary resistance and then melts the conductor. An underground wire is more likely to have unequally corroded sections than an aerial one, and so furnishes first-class opportunities for the lightning to fuse and part it, where, in the case of a wire hung in the air, the resistance and damage would more likely occur in the office connections or apparatus. As is well known, the electric locks of the Union Signal Company's interlocking machines are so arranged that the circuit, through the rails, when closed holds the armature away from its slot and thus leaves the lever unlocked, so that any *breaking* of a connection by lightning or otherwise will lock the lever; which is in the direction of safety. But anything which should connect the two parts of the circuit so as to leave it normal with the rails excluded would leave the levers permanently unlocked.

A disinterested observer might, with considerable reason, conclude that the regular through passenger rates between the seaboard and Chicago and St. Louis are absolutely high and unreasonable, and that the normal rate would be considerably lower. For years the rate wars and "cutting" of various sorts have made the actual average rate considerably less than the published tariffs, and the heavy commissions paid have reduced the net amount received by the roads still lower. Now for six months the regular rates have been well maintained, and payments for commissions what have been greatly curtailed or wholly stopped. But is the result? All at once reductions are made which are larger and more sudden than usual, and apparently with much less cause than has generally been the case heretofore. They cut into the very centre of the pie at once, being made on rates that influence the heaviest lines at the first stroke; and before one can turn around, the business at New York, Chicago, St. Louis, Cincinnati and Philadelphia is entirely demoralized, or at least reduced to a point where there is no profit.

To live without the excitement of competition in rates seems to be still regarded by the passenger men as an unendurable condition. To advance one's own interests (and freeze out the other fellow) by such commonplace methods as fast time, numerous trains, better attention or other improvements of service, and by exercising the art of telling the public of these facts, is entirely too tame a business and one beneath the capacity and mental liveliness of the "traffic" men. Whether the limitations of the "fourth section" will, in view of the possible loophole in the clause concerning excursion tickets, have any effect in keeping the rates from going to the lowest depths, remains to be seen. If rates were to remain at about cost figures or lower for any length of time the passenger men would, under the considerable pressure from the general managers which keeps them from getting much enjoyment out of dickering with commission payments, be compelled to take up their abode in Wall street, wherein the lack of spontaneous activity, entertaining bubbles can be manufactured to order out of pure wind.

TRIALS OF THE STRONG LOCOMOTIVE.

In another column we publish the essential features of some experiments made by Mr. J. S. Coon to determine the performance of the Strong locomotive, in comparison with a locomotive of the ordinary type, together with the comments of the distinguished mechanical engineer, Mr. E. D. Leavitt, Jr., upon the results. It will be seen that Mr. Leavitt entertains a very favorable opinion of the Strong locomotive, and possibly he may have some data not contained in the report, upon which he relies in forming his opinions. He says, for example: "In my judgment, Mr. Strong's valve gear

for the locomotive promises to do what Mr. Corliss has accomplished for stationary engines;" and he calls attention to indicator diagrams not contained in the report in support of this statement, and also the extraordinary horse-power obtained, on account of the good inlet and free exhaust. Now, as it is well known, the adoption of the Corliss valve gear in stationary practice accomplished two results; it increased the power developed by an engine having a given size of cylinder and greatly reduced the cost of the power. Speaking approximately, the Corliss engine using from 25 to 30 pounds of steam hourly per indicated horse-power, displaced motors which required from 45 to 60 pounds. There is no such margin for saving in the locomotive, the modern locomotive of ordinary type being anything but a wasteful steam engine. The experiments of Mr. George Marie, in France, have a direct bearing on this point. Briefly summarized, the results obtained by Mr. Marie are as follows:

Fuel (compressed dust).	Pounds of coal hourly per indicated horse-power.	Pounds of water hourly per pound of coal.
Anzin	2.88	8.88
Grand' Combe	2.84	9.15
La Chazotte	2.99	8.68

The experimenter, after a theoretical investigation of the performance of the locomotive, goes on to say:*

> The author made a similar investigation with reference to a boiler and engine on the Corliss system, with condensation. * * * The efficiency of the boiler and of the engine, compared with the theoretical result of thermodynamics, has been calculated with the following results:
> Efficiency of boiler, 64 per cent.
> Efficiency of mechanism alone, 53 per cent.
> The results are almost exactly the same as with locomotives, which give, as we have seen:
> Efficiency of boiler, 65 per cent.
> Efficiency of mechanism, 54 per cent.

That is to say, the locomotive, compared with a theoretically perfect locomotive, is quite as good as a Corliss condensing engine compared with a theoretically perfect engine working as a Corliss engine.

In an article commenting upon Mr. Marie's experiments, it is stated, *Railroad Gazette*, March 14, 1884: "Some other experiments made by M. Regray on express engines on another French railroad show more economical results, the average consumption being 3.01 lbs. per indicated horse-power, and the minimum 2.48 lbs."

The foregoing results, it will be noticed, are all better than those obtained with the Strong locomotive, which are summarized below for comparison.

	Engine 444. Strong valve gear and Strong locomotive.		Engine 383. Strong valve gear and boiler of ordinary type.		Engine 357. Locomotive of ordinary type.	
	Lbs. of coal hourly per I. H. P.	Lbs. of water per lb. of coal	Lbs. of coal hourly per I. H. P.	Lbs. of water per lb. of coal	Lbs. of coal hourly per I. H. P.	Lbs. of water per lb. of coal
Maximum	4.16	8.56	4.67	5.78	5.48	6.20
Minimum	3.38	6.40	3.69	5.23	4.10	5.79
Average	3.78	7.31	4.32	5.44	4.72	5.99

The large amount of power developed by the Strong locomotive (from 1,369.3 to 1,810.8 horse-power, as shown by the diagrams published in another column) is a very interesting and important point, and it is to be regretted that more particulars of this performance were not given. The results, in respect to initial, mean and back pressure, are apparently so unusual, that it would have been well to present these data in detail. It will be seen from the diagrams that, with a boiler pressure of 160 pounds, the initial pressure is between 154 and 159 pounds, never differing more than 6 pounds from the boiler pressure; and that, with a speed of 326 revolutions a minute, the back pressure apparently does not exceed 7½ pounds per square inch. Some time ago we published diagrams from locomotive No. 353, having the Strong valve gear,* the engine running at a moderate rate of speed (from 86 to 200 revolutions a minute), and showing a back pressure varying from one to seven pounds, and a difference between pressure in boiler and initial pressure of from 9 to 22 pounds per square inch. The omission from Mr. Coon's report of similar data concerning the diagrams taken during his experiments is a serious one.

The report under consideration shows that the increased power of the Strong locomotive is obtained at the expense of a considerable increase in weight—locomotive No. 444, with the Strong boiler and the Strong valve gear, weighing 138,000 lbs., while locomotive No. 357, of the ordinary type, weighs 90,750 lbs. This increase of weight might be desirable in some cases, but on the road where the experiments were tried, the lightest engine was apparently heavy enough to perform the service, and as the road contained many grades, the increased weight of locomotive No. 444 was a drawback, calling for the exertion of more power than would otherwise have been required, and, consequently, for an increased consumption of coal and water. This is to be remembered in considering the results contained in the report.

The manner of measuring the coal burned in these experiments seems to be open to serious objections. Each trip consisted of a run from Wilkesbarre to Mauch Chunk and return, consuming, with stops, 5 hours and 35 minutes. On starting a clean fire was made, and it was presumably left in the same apparent condition at the completion of the trip, although this is not stated. It is impossible to make an accurate measurement, in this manner, of coal actually consumed, since a slight error in the judgment of the experimenter as to the state of the fire might make a difference of several hundred pounds of coal. For short experiments, if the coal is to be accurately measured, a fresh fire must be started with weighed fuel, and at the conclusion of the experiment the contents of the furnace must be hauled and weighed. As these precautions were apparently neglected in the present experiments, the records of coal consumption, evaporation, and consumption of fuel per horse-power are open to serious doubt.

It might be expected that the locomotives having the Strong valve gear would make better time on grades than the locomotives of ordinary type; and on page 10 of the report there is a comparative record of runs from Sugar Notch to Fairview, in which locomotive No. 383 made the trip in 2 minutes and 21 seconds less time than locomotive No. 357. A comparative record of the time consumed by the three locomotives on heavy grades would have been very interesting.

There is one point of great importance to which no reference is made in Mr. Coon's report. All persons who are familiar with the running of locomotives know that the difference between the best and worst mode of running often affects the coal and water consumption in the same engine as much as 20 per cent., and the absence of any particulars concerning position of throttle and link affects the final results to a considerable extent.

It will be seen that there is a great difference in the economy, as measured by water consumption hourly per indicated horse-power, between engine 444 and engine 383; almost as great a difference in fact as between engine 383 and engine 357. The following table, compiled from the report, illustrates this point:

	Pounds of water hourly per indicated horse-power.		
	Engine 444.	Engine 383.	Engine 357.
Maximum	31.05	24.42	31.75
Minimum	25.77	21.33	25.40
Average	27.94	23.73	28.42

No reason is given in the report for this difference between the performance of engines 444 and 383, both having the Strong valve gear. It may be due to difference of management or to some other cause, but possibly full details of the manipulation would have thrown some light upon the subject. An able experimenter has well remarked that, in giving the report of a test, all details, however trivial they may seem, should be furnished.

We conclude, after a careful examination of the report, that the Strong locomotive has decided points of superiority over the American locomotive of standard type, and is possibly superior (although more experiments would be necessary to decide this point definitely) to all other locomotives of any type.

* *American Engineer*, Aug. 1, 1884.
* *Railroad Gazette*, March 19, 1886.

The Wheat Crop of 1887.

The wheat crop, winter and spring together, promises to be about 424 to 430 million bushels. There were in the visible and invisible supply on June 30, 1887, flour being included and reckoned at its equivalent in wheat, about 71 million bushels, making 495 million to 501 million bushels. If we estimate the domestic consumption for seeding, food and manufactures at 345 million bushels, and the reserve at 40 millions, there remain 110 to 116 million bushels for export. There have been exported from both coasts in the ten weeks ended Sept. 10 about 38,373,000 bushels in wheat and flour together, and there remain available for export 72 to 78 million bushels.

The winter wheat was cut and carried under generally favorable conditions. An important part of the spring wheat crop in Minnesota and Dakota has been deteriorated in quality by heavy rainfalls during the cutting and stacking. Of about 170 cars daily received at Minneapolis in all of last week, about one-quarter was inspected "no grade," which is damp or wet and unfit for flour-making. This condition diminishes the value 5 to 10 cents per bushel.

The September report of the United States Department of Agriculture makes the average condition of winter and spring wheat together at harvest 82 against 87.8 in 1886 and 72 in 1885. In the spring wheat region Dakota is 89, Minnesota 72, Iowa 71, and Nebraska 76. The area of spring wheat is six per cent. larger than in 1886, and that of winter wheat two per cent. smaller than last year. The drouth prevailing in Southern Ohio, Indiana and Illinois, extending through Kentucky and Tennessee, has made it impossible to plough the ground for winter wheat for the 1888 crop, which will probably cause a somewhat diminished area of winter wheat in these states to be sown this autumn.

The European demand for our wheat and flour has taken out of the country in the ten weeks from July 1 to Sept. 10 the equivalent of about 38 million bushels of wheat. The demand reflected in the exports for the week ended Sept. 10, 1887, took, in wheat and flour, from eight Atlantic ports 2,289,250 bushels of wheat and flour as wheat, and from Pacific ports 304,000 bushels, or a total of 2,593,250 bushels. In the outward movement from eight Atlantic ports there were 520,950 bushels directed to the Continent of Europe and the remainder to the United Kingdom.

The average European wheat production for the six years from 1881 to 1886 in twenty nationalities was 1,711,072,182 bushels. In the United Kingdom, from 1876 to 1885 inclusive, the yearly average wheat production was 81,452,364 bushels; average imports, 131,262,482 bushels; average exports, 2,598,763 bushels; average annual supply from domestic wheat and foreign wheat and flour, 210,116,083 bushels. The area under wheat in the United Kingdom for this year's crop is officially stated to be 2,383,584 acres, and the London *Times* and the *Mark Lane Express* estimate the average yield per acre at 30 bushels, which would give an output of 71,507,520 bushels. The quantity required for seeding at 2½ bushels per acre is 5,963,960 bushels, leaving wheat for home food 65,543,560 bushels. If consumption is normal, the regular imports of foreign wheat and flour from Sept. 1, 1887, to Aug. 31, 1888, should not be less than 144,572,523 bushels. Present stocks in United Kingdom, Sept. 1, 1887, are about 18 to 19 million bushels, or 2 to 3 millions above normal. The United Kingdom's wheat crop of 1886 was 65,285,353 bushels.

The French wheat crop of 1887 is estimated at about 11 million bushels over the average of 10 years, but the reserves of old wheat and flour Aug. 1 were small. France imports about 41 million bushels ordinarily. The preliminary estimates for Russia give a surplus for possible export of upwards of 60 million bushels, which is slightly less than the average, but 10 millions more than she exported last year. The estimate of the Italian wheat crop is 18 million bushels below the average, and 11 million bushels below the crop of 1886, and the probable import will be 18 to 20 million bushels, or nearly twice the average. The most reliable information from other continental countries indicates no material variations in crop or probable import from the average. The prospect is that the European imports will require from 160 to 170 million bushels of wheat from extra-European countries.

The British Indian export in their crop season ending March 31, 1887, was 12,160,000 bushels, the largest recorded. The results of the next crop cannot be forecast, but the exports for the next six months will probably be small. In the two weeks ended Sept. 10 they were but 310,000 bushels.

The average wheat production of Australia from 1873 to 1884 has been 28,568,691 bushels; average imports same period, 3,202,368 bushels: average exports, 10,720,576 bushels; average net exports, 7,518,208 bushels. In 1885 and 1886, the crop has been poor and exports small. The area sown to wheat for the crop to be harvested in January, 1888, is larger than ever before; there have been abundant rains, seeding was done under favorable conditions, and there is promise of an unusually fine crop.

The wheat crop of Europe for 1887 has been harvested in exceptionally fine condition, and the larger portion of it is of superior quality, which makes it ready for immediate manufacture into flour for consumption. The exporting countries, outside of Europe, can only expect demand from European importers as the need is felt of supplementing their home crops, which may possibly not be, for some of the importing countries, till well forward in the year 1888. Hence it will not be a surprise to find a slow demand for several months to come, even at the present abnormally low prices.

The Corn Crop.

The area of the corn crop in 1886 was 75,604,208 acres. The area for the 1887 crop, by preliminary estimate, is about 78 million acres. The condition of the crop by the September report of the Department of Agriculture is 72.3 against 80.5 by the August report. The present condition is four points lower than its condition in September, 1886. The aggregate yield of the 1886 crop was 1,665,441,000 bushels, valued at $610,311,000. The average yield per acre for the crop of 1886 was 22 bushels, against 26½ bushels average yield of the crop of 1885. In 1881 the September report was 60, which, with favorable weather, improved six points in October.

The falling off this year is nearly all in what is denominated the commercial or surplus states—those from which most of the corn is derived that comes into commercial channels and is moved to the trade centres. In the seven states of this class the August report made the condition 74, against 64 by the September report or 10 points off. The condition by the September report is, Ohio, 86; Indiana, 81; Illinois, 57; Iowa, 78; Missouri, 67; Kansas, 42; Nebraska, 72. The average of New York and Pennsylvania is 98; of Georgia, 98; of Texas, 88; of Tennessee, 80; and Kentucky, 80. The southern states promise to have a larger corn yield this year than usual, and will require to draw less than the usual quantity from the northern states.

The corn production of the states of Ohio, Indiana, Illinois, Iowa, Missouri, Kansas and Nebraska for six years was in *millions* of bushels :

1886	1,001	1883	980
1885	1,279	1882	955
1884	1,175	1881	738

In the states of Kentucky, Tennessee, Michigan, Wisconsin and Minnesota it was in *millions* of bushels :

1886	238	1883	201
1885	249	1882	233
1884	214	1881	158

And in all the other states it was :

1886	426	1883	870
1885	448	1882	429
1884	405	1881	299

The grand aggregate corn production in all the states was in *millions* of bushels :

1886	1,665	1883	1,551
1885	1,936	1882	1,617
1884	1,795	1881	1,195

The average was 1,627 million bushels.

The condition of the corn crop of 1887 as a whole may be somewhat improved by the October report, as in 1881. The indications now are that the aggregate yield of the 1887 corn crop will range somewhere between 1,500 million and 1,600 million bushels. From 1876 to 1885 the average corn area was 60,742,818 acres; average aggregate yield, 1,558,950,545 bushels, and average exports, 68,693,286 bushels, or 4.4 per cent. of the production.

The export in the fiscal year 1886–7 ended June 30 was under the average, being only 41,368,580 bushels, against 64,829,617 bushels in the corresponding period in 1885–6. The cause of the diminished exports of corn from the United States in 1886–7 was mainly in the very good corn crops in South Russia, on the Danube, in Austria-Hungary, Turkey and the Argentine Republic, and the abundant potato and root crops, as well as feeding grain in the United Kingdom and on the continent. This season the hay and root crops and the feeding grains, barley and oats, are deficient from the effects of the drouth in the United Kingdom, and in North Western continental Europe. Germany, France and the United Kingdom are estimated to be this season deficient about 6,000,000 tons of potatoes. This will be likely to give an improved demand from Europe for our corn, oats, oil cake, cotton-seed cake, etc.; the more so as the corn crop on the Danube, in South Russia, Turkey and Austro-Hungary is this year deficient in consequence of excessive and prolonged drouth at a critical period of its growth.

The Black-list.

In a case noted in our legal intelligence the Supreme Court of the state of Michigan holds that "discharge lists" given by one division officer to another are privileged communications and not libelous. It will be remembered that in the case at New Haven, Conn., a few months ago, in which two officers were held, in a minor court, for conspiracy, the superintendent of one road was held to have overstepped the bounds of the law when he gave to an officer of *another road* his list of men who had been discharged. Much has been said concerning boycotting and "blacklisting" of railroad employés, but there is much more talk than sense. The injustice in such cases, if there be injustice, is generally in proportion to the degree of variation from the truth. If a brakeman is addicted to drink, or is lazy, or quarrelsome, or insubordinate, or dishonest, or guilty of any one of the numerous other characteristics which render a man undesirable as a brakeman, it is no great injustice to him to have these facts made known to an officer who contemplates hiring him, and an employer knowing such facts would, if he withheld them when asked, be guilty of deceit. And as probably very few superintendents take the trouble to publish the "characters" of their discharged men, except where a desire for the information has been expressed, the evil motives so often ascribed must exist generally in the imagination only. Nevertheless, it is well that the law should impose wholesome restrictions. Doubtless there are, unfortunately, men who will step out of their way to do a large injury in revenge for a very small one; who will deliberately injure a man's chances for getting a living when his worst sin may have been "independence," or the use of an indiscreet tongue, or some action that has hurt the superior's pride. It is pretty safe to say that no one will ever have injuries redressed, or receive substantial benefit directly in any way from the application of such a law, but it is well to have its warning presence on the statute book notwithstanding. Probably the principal value of a legal enactment on this subject would be in the wholesome deterrent effect it would have with those who are not malicious, but careless. Many a man would exchange "blacklists" with a neighbor without intending the least harm, and even with benevolent intent, and yet work injury merely by mistakes of judgment and carelessness. No one's judgment is perfect, and few superintendents personally know their men in lower grades well enough to express a positive opinion concerning their general qualifications; and giving subordinates' opinions instead of one's own lets in chances for all sorts of errors. There can be no question that a road having good grounds for discharging a man at one place has equally good right to refuse to employ him at another, however distant; and if the Union Pacific, for instance, turns off a man at Omaha it can take any means at hand to advise the officers at Ogden not to hire him. Any construction of law or duty which should prohibit the division superintendent at one place from communicating with his brother at the other, could be easily evaded by having all engagements of new men and all dismissals referred to the General Superintendent for final approval. The officers at New Haven were on different roads, but the roads were and are under substantially the same ownership and control, so that morally the men had just as good right to tell *facts* to each other as if they had been under one official head. And just here is the point at issue, if there is any issue. The communication to those directly interested of plain and indisputable *facts* concerning a servant's desirability as a servant and a master's desirability as a master ought never to be interdicted; but the mixing of opinions with facts is so liable to lead to wrong, or at least to unpleasant and regrettable results, that well-disposed men ought to gladly support any restrictions which may be found likely to be useful for good. And it is to be said to the credit of American railroad officers generally, from yardmasters up to presidents, that the men among them who violate the golden rule in this matter are few and far between; while those who treat delinquent and ungrateful subordinates much better than they deserve, and whose consciences trouble them chiefly because of the deceit they have practiced on superintendents in *not* warning them against unfaithful men, are numerous.

American and English Locomotives.

The following paragraph appears in the columns of *Bradstreet's*:

An English journal notes that from time to time statements are circulated to the effect that American locomotive engines are growing in favor in the newer countries on account of their supposed superiority to English engines in combined lightness and strength. "A Colonial Locomotive Superintendent" (at Sydney) has taken the opportunity in a letter to the *Engineer* of denying the alleged advantage of American locomotives. He says that he has had experience with both English and American engines and that English engines are not heavier than American and they are much more durable. At the same time he admits that some dissatisfaction has been expressed, in New Zealand chiefly, with certain locomotives obtained from England, and he explains the ground of it as follows: "Owing to some unexplained cause, orders have gone to firms in England who do not regularly make locomotives and are not famous for the quality of the work turned out." * * * "The proof of the pudding lies in the eating, and as one English firm exported in 1885 more locomotives than all the American firms put together, it is evident that English makers are doing a larger trade than America in exporting locomotives."

It does not seem that there can be any question about *weight* as a national characteristic of locomotives. A company ordering a 45-ton locomotive would be apt to get about a 45-ton locomotive whether it was ordered in America, England, Belgium or any other country. The writer, however, probably had in mind the common claim that our locomotives have a greater tractive power per ton of weight than can be got with locomotives of the English patterns. A denial of this doctrine with proofs drawn from experiment, not from the assertions of "A Colonial Locomotive Superintendent," could not fail to influence American locomotive construction.

The real question, which is of interest to foreign corporations and governments proposing to purchase rolling stock, is as to the first cost, efficiency and cost of renewals and repairs of the locomotives built in the two countries, to which may be added the general character for honesty and good work possessed by the builders. In the matter of first cost there is not much to be said. As was shown in the *Railroad Gazette* of March 25, 1887, we compete successfully when locomotive building is dull here, and England is successful in outside markets in those years of depression which she, too, experiences.

As to the effectiveness, Mr. Jeans, in his "Railway Problems," shows, p. 125, that the average number of miles run by English locomotives is 17 539 per annum, and by American locomotives the average is 23,928, while the average train load in the United States is 98 tons or passengers, against 57 carried on British trains, showing that the American has fully 2⅛ times the effectiveness or earning capacity of the English locomotive.

This may be considered another form of the proof of the pudding by eating, although, of course, it is not contended that the difference shown in useful work done is due entirely to the difference in locomotives.

Mr. Dorsey found that on fourteen English railroads the item of renewals and repairs of locomotives was 7.8 per cent. of total operating expenses, against 5.7 per cent. as the average of eight American roads, or allowing for difference of wages the comparison would be even more favorable to the American locomotives. Again, on the basis of the ton-mile he finds this item of cost 0.08 cents on the London & Northwestern and 0.037 on the Pennsylvania.

But the fact that the Canadian roads long ago entirely discarded English locomotives, although the roads have been largely owned and officered by Englishmen, and another fact, shown in the number of the *Railroad Gazette* quoted above, *i. e.*, that of the 12½ million dollars' worth of locomotives lately exported by our makers, 39 per cent. have gone to England and English dependencies, are more convincing than calculations like the above.

Sir Julius Vogel is known to have said of the Baldwin locomotives bought for the government of New Zealand that they were better and 20 per cent. cheaper than the English locomotives, which were delivered about the same time; but it was generally understood in this country that the English builders were reputable, if not "famous for the quality of work turned out." A London journal has stated that there is a demand from South Australia that locomotives be bought from local builders, with an offer of 25 per cent. advance over British market prices. "Then," says the colonist, "we shall get locomotives that will not throw out their cylinders for old iron before they are two years old." This suggests to an "astute Yankee" that possibly the same English firms which inexplicably secured the New Zealand order have been building locomotives for South Australia.

We have no wish to disparage English locomotives or locomotive builders. Honesty and mechanical talent are found in the builders of both nations. In fact, we should say that these qualities are found to an extraordinary degree in this industry; and the product is most admirable. We of America have still some lessons to learn, too, from the British mechanics, and they have quite as many to learn from us. But ignorant or willful misrepresentation is neither instructive nor agreeable.

The Chinese-American Concession.

There is a great deal of surprise and uncertainty, with no little envy, expressed and understood, in regard to this concession.

The *American*, of Philadelphia, which by some is supposed to have good opportunity of knowing Mr. Barker's plans, says: "Upon the initiative of a syndicate of Philadelphia capitalists, of whom Mr. Wharton Barker is the representative, concessions of far-reaching importance to the future development of the Middle Kingdom and to the commercial

interests of the United States have been granted. The negotiations to this end were conducted by Count de Mitkiewicz, of Washington, D. C., and Mr. Simon A. Stern, of Philadelphia—the former being the negotiator, and the latter the financial representative of Mr. Barker and his associates. They have covered a period of some months, and now appear substantially complete." After a dissertation on Chinese trade and finance, the journal adds that the Count has obtained for the Chinese-American Telephone Company the exclusive right to erect and operate telephone wires in all the treaty ports now open, or to be hereafter opened, for a period of fifty years. In addition to which he has a basis of a charter for a Chinese-American bank, to be under joint American and Chinese control, the capital of which is to be contributed jointly by Americans and Chinese, which, in addition to a general banking business, will place all government loans for such public purposes as constructing railroads, working mines and contracting for needful supplies for such undertakings. It is also to have authority to issue bank bills, and provide a uniform currency in gold and silver, which is to be a legal tender throughout the kingdom.

As all the continental nations, with England, have been trying for some time to accomplish some such arrangement as the above, the first announcement of the success of the Philadelphia syndicate was received with extreme incredulity; but the abuse of the project contained in the English papers published in China, which came to hand shortly after the announcement, left no room for doubt that the Philadelphians had come remarkably near success if they had not succeeded. This was distressing to the editors of those newspapers, a great deal of whose stock in trade has been an explanation of the American inferiority in commerce and manufactures, with an occasional attack on their countrymen for the boodlum abuse of Chinese laborers; and they have displayed full as much irritation over the result of this negotiation as their English contemporaries, prophesying loss to the Philadelphians and charging many sins to the Count, causing pain to the Philadelphia editors; and the latter answer back with acerbity and the mention of names, charging a small jealousy against the good fortune of the Philadelphia capitalists, even though the Philadelphia editors had in like manner cheapened the efforts of the Boston capitalists in Mexico.

As for Count de Mitkiewicz's character, it is a remarkable and unfortunate circumstance that from the time of Swift, who advised the Irish to burn everything English except their coal, to the exposure of the selfish aims of Katskoff in a recent number of the *Tribune*, no person who has not had *some* moral obliquity has ever interfered with the trade and commerce of Great Britain.

But though it is not certain that all of the concessions above mentioned will be confirmed to the Barker syndicate, it has long been understood that in general the Chinese statesmen feared indebtedness to any European syndicate, as the capitalists of those countries can always force their governments to espouse their cause where a weaker debtor nation is in question. This government, on the contrary, is not troubled by its debts, and any body of capitalists coming before the people with a request for governmental assistance in collecting a foreign debt would simply, as the Chinese must know, receive unlimited abuse from both newspapers and congressmen.

The advantages to this country from the arrangement, if it is consummated, will be great; it will give to our trade with China the same or a greater improvement that our railroad building gave to our trade with Mexico, and will offer a field for the employment of engineers, mechanics and business men generally, far exceeding that offered by Mexico. The Chinese will get much more railroad with better and more reliable rolling stock for their expenditures than they will be able to obtain in any other market, and this, with less danger of interference with their autonomy.

Lake Superior and Bilbao Ores.

In our issue of July 1 attention was called to the diminishing supply of Bessemer ores available for European steel making, and in the last number of the *Bulletin* of the American Iron and Steel Association is a comparison of the production of the Bilbao ore deposit with that of the Lake Superior mines since 1860. The figures given are as follows:

YEAR	Bilbao district. Metric tons.	Lake Superior district. Gross tons.	YEAR.	Bilbao district. Metric tons.	Lake Superior district. Gross tons.
1860...	69,816	114,401	1875..	*34 296	891.257
1861...	54,869	49 909	1876..	*32,418	992,764
1862...	70.460	124 1-9	1877..	1.040, 64	1,014.687
1863..	70,720	205,05-	1878..	1,305,656	1.1'1.110
1864...	120,470	24-,127	1879..	1,262.671	1,375,691
1865 ..	102,360	- 6 208	1880..	2.683,627	1,90*,647
1866 ..	89,912	278,796	1881..	2 6.0.6 8	2,314,502
1867...	136,- 75	473,567	1882..	†3,855,000	2.966,375
1868...	154,120	491.449	1883..	3,627 752	2,341,227
1869...	164,803	6-7,444	1884..	3.216,321	2.518 048
1870...	250,337	830 940	1885..	3.317.419	2,456.548
1871...	403,142	779,607	1886..	3,185,-28	†3,562,570
1872..	40 .000	90 .901			
1873 ..	305.340	1,-.2.458	Total.	29,040,520	30,879,014
1874...	*,0,821	919,557			

* Carlist war. † Maxima.

or in gross tons.

	Bilbao district.	Lake Superior district.
Total for 27 years	28,575,872	30,879,014
Yearly average	1,058,366	1,143,667

The output of the two mineral districts are seen to have been about the same, and if the yield of the Gogebic and Vermillion mines is excluded the figures would stand for the Marquette and Menominee ranges 29,409,941 gross tons.

M. Alexander Pourcel says in effect of the Bilbao mines, in 1882 the quantity of ore shipped rose suddenly to 3,855,000 tons, and since that has steadily diminished. The majority of the mines worked by private parties, which are specially the source of the ore exported, have been exhausted or are about to be, though if the demand required it 4,000,000 tons might be mined in 1888, and as much in 1889, but would then drop to about 3,000,000, and after 1890 or 1891 the quantity of ore available for the open market will be more and more restricted, and before ten years have elapsed the output will drop to close upon 2,000,000 tons.

Nor does it seem that the Menominee and Marquette ranges can be relied on to increase their production, and at their utmost probable production for 1886 there would have been a deficiency of more than 750,000 tons, which, without the intervention of the Gogebic and Vermillion ores, would have increased our importations of foreign ores (2,118,357 tons in the fiscal year ending Jan. 30, 1887), or have led to additional purchases of foreign pig or other iron. With the present new development of ores on Lake Superior all demands made on that locality for years are likely to be easily met after sufficient transportation is provided.

Nearly all of the Bilbao ore has been exported, Spain deriving only the benefit of miners' wages and export duty, but our Lake Superior ores have all been smelted in this country, building up the steel industries of Pittsburgh, Chicago Joliet, etc., and placing us in the first place as steel producers.

The improvements on the Harlem division of the New York Central & Hudson River, briefly noted in the *Railroad Gazette* of Aug. 19, are, it appears, to be begun this fall, and, the work being comparatively easy, will doubtless be pushed to an early completion. The word "easy" is of course *only* comparative, and is used because there are few or no deep rock cuttings, and no streams of any consequence, and access with horse-carts to the right of way on both sides for most of the distance is very favorable. But "easy" in anything like a strict sense cannot be applied to the rebuilding of five miles of a railroad which is crowded with passenger trains for 18 hours a day and used by freights the other six, and where the demolition or partial rebuilding of dozens of buildings is involved.

The grade of the track will not be changed south of the Y, where the Hudson River division joins the Harlem just north of Mott Haven, though the street at the south end of the station at the latter place will be raised and carried on an overhead bridge. In the five miles above the Y there are eight stations, nearly or quite all of which will be replaced by new ones. Most of the present station buildings at these places are ancient, and would be much more appropriate to the backwoods of North Carolina than to a rich suburban line in New York state, and their replacement by good ones will greatly enhance the desirableness of the localities as residences, while the expense to the railroad will be an item which doubtless has been provided for long since. This, with the four-tracking of the road, which is to be done so as to provide a separate pair for the New York, New Haven & Hartford trains, will increase the facilities of the road to such an extent as to materially advance the value of either vicinity property, and thus offset the expenses of street alterations and damages to abutters. This last item has not yet been much talked of, though the accounts seem to indicate that the Board of Park Commissioners, who have charge of the matter on behalf of the city, are satisfied to have the responsibility for all work outside the railroad's right of way thrown upon the city. The cost of the work within the right of way, including the building of two outside tracks at the new level and the subsequent depression of the present two to the same grade, the construction of 21 overhead bridges and the alteration of numerous buildings, largely old dwellings owned by the road, is estimated at from $1,250,000 to $1,500,000, and this the road has agreed to bear.

The increased facility with which southward trains can reach Mott Haven will make the disadvantages south of that point, the crowded tunnel and the still worse crowded yard at the Grand Central Station, still more manifest than at present. The delays in getting trains into this station are already serious and constantly burdensome, and the time is not far distant when heroic measures of relief must be undertaken.

In our last week's issue we noted the fact that a citizens association in Chicago is stirring in the matter of casualties at street crossings.

The committee on railroads of that city is framing, with the aid of Judge Green, an ordinance which will allow railroads to run at high speed within the city limits. The ordinance provides that the railroads must inclose their tracks by walls, build viaducts at the principal crossings, and at minor crossings operate gates from towers. At present the only Chicago road which has no restrictions as to speed placed upon it is the Illinois Central, which runs along the Lake Michigan Shore from the Madison Park, 6 miles out, to Lake street depot. There are no railroads or street crossings and a substantial brick wall divides the right of way from the public thoroughfares within the city limits between Oakland and Sixtenth street stations. In spite of these facilities the Michigan Central and Illinois Central, both of which run over the same track, use up 50 minutes in going 15 miles to Kensington, though but two stops are necessary. The Pittsburgh, Fort Wayne & Chicago has voluntarily made such an arrangement as the proposed ordinance will make compulsory, and when its viaducts are completed it will enjoy the same advantages as the Illinois Central, save that the line crosses several railroads between Englewood and Chicago which will occasion several stops and a consequent loss of time. Of course, changes of this kind involve very great expenditures, and the roads that are so fortunate as to be able to prosecute them regularly and rapidly are few; but it is well, nevertheless, for the city to lay down its policy.

The administration report on the railroads of India shows that during the year ending Dec. 31, 1886, 1,014 miles were added to the system, bringing the total mileage up to 13,390 miles. The total capital expenditure, including lines under construction and survey, was £187,371,000, or very nearly $65,000 per mile.

The gross earnings were £18,704,000, or $6,816 per mile. The working expenses were about 48 per cent. and the dividend 5.73 per cent. or excluding steamboat service and expense account, 5.9 per cent. The traffic account for 1884 and 1886 was as below.

	1884.	1886.
Mean miles open for traffic	11,114.37	12,584.83
Passengers carried	73,814,119	88,436,318
Tons carried	16,663,007	19,576,365
Passenger mileage	3,755,746,323	3,894,076,609
Ton mileage	2,761,5 8, 24	3,388,000,208
Train mileage	39,609,785	45,475,834
Average length of ride, miles		44
Average length of haul, miles		173
Average tons of passengers per train		101

The amount of surplus profits earned by the guaranteed roads was for the year ending Dec. 31, 1879, £7,474,596, and for that ending Dec. 31, 1886, £12,693,283.

Ore shipments from Lake Superior ports continue so plentiful that boats whose contracts expire quickly renew them, and at increased rates. At Escanaba $1.65 has been paid to Ohio ports. This keeps the supply of shipping at Chicago so short that rates remain very steady at 4 cents on wheat to Buffalo. The canal rate from Buffalo to New York is 4⅝ cents, so that the water route, through, gets about as much as the railroads are said to have received on large quantities of export grain. In fact, if reports made in very positive language may be believed, grain is being carried from Chicago to the seaboard by rail at considerably less than 15 cents.

Record of New Railroad Construction.

Information of the laying of track on new railroad lines in 1887, not before reported, is given as follows:

Kansas City, Independence & Park, from Kansas City to Independence, Mo., 12 miles.

State Run, from State Run, Lycoming County, to Black Forest, Potter County, Pa., 10 miles.

Southern Ohio River, from Lawrenceburgh to Rising Sun, Ind., 15 miles.

St. Paul, Minneapolis & Manitoba, Benson to Watertown Dak., 91 miles; 26 miles since last reported.

This is a total of 63 miles heretofore unreported, making 4,797 miles reported thus far for the current year. The new track reported to the corresponding date for 16 years has been:

	Miles.		Miles.		Miles.		Miles.
1887.....	4,797	1883.....	3,087	1879.....	2,064	1875.....	761
1886.....	3,439	1882.....	7,164	1878.....	1,245	1874.....	1,084
1885.....	1,670	1881.....	4,474	1877.....	1,435	1873.....	2,691
1884.....	2,384	1880.....	3,549	1876.....	1,599	1872.....	4,765

This statement covers *main track only*, second or other additional tracks and sidings not being counted.

TECHNICAL.

The Car Shops.

The Atchison, Topeka & Santa Fe has given to the Pullman Car Company an order for eight trains, each to consist of seven cars—two Pullman, two coaches, a smoker, a baggage, and an express. These are to be finished by the first of May next.

The McMillan Car Works at Minaville, Kan., will build a foundry 85 × 221 ft. The capacity will be 200 wheels per day.

Bridge Notes.

The Boston & Lowell will build a bridge at Lunenberg Vt.

The Georgia Railroad Co. will build a bridge at Oconee, Ga. S. A. Hemphill, Augusta, Superintendent.

Dennis Long and J. G. Howard will build a bridge at Jeffersonville, Ky.

Bids are requested for an iron bridge across the Mississippi River, between Minneapolis and St. Paul. Address until Sept. 20 J. S. Sewell, Engineer, 48 Gilfillan Block, St. Paul, Minn.

Iron and Steel.

The Croun Creek Iron & Steel Co., of Chester, Pa., has been incorporated. Capital stock, $500,000. C. K. Lippincott, D. R. Esrey, J. Swanger, J. D. M. Cordeza and W. Provost, Jr., incorporators.

The Laclede Rolling Mills, St. Louis, Mo., are running several puddling and scrap furnaces, and the bar and guide mills, all double turn. Their product is now about 1400 tons a month.

Matthew Beazel, of Bellaire, O., has organized a company for the erection of a large foundry at Findlay. The city gives the company eight acres of ground for the new plant.

Morrison & Dougherty are to build large boiler and iron plate shops in Pittsburgh, Pa., and will begin work during this month.

The works of the Columbia Iron & Steel Co., of Pittsburgh, which are located in Uniontown, Fayette County, Pa., were started the first of this month. They have been in course of construction for the past year. The works will manufacture structural iron and steel, blooms, billets, slabs, etc.

On Oct. 1 Mr. Stephen Neumeyer, who has been Superintendent of the Allentown Iron Co., of Allentown, Pa., for some years, will retire, and his place will be taken by Mr. E. H. Earnshaw, of Ashland, Baltimore County, Md.

The Rail Market.

Steel Rails.—A sale of 12,000 tons has been made to the Brunswick & Western, delivered at Brunswick, Ga., at about $40; 8,000 tons to the New York, Lake Erie & Western. Quotations, $36@$36.50 for 1888 delivery; $37@$37.50 for 1887 delivery, standard sections.

Old Rails.—Market dull with no important sales reported. Among lots in the market are 3,000 tons tees from a Southern road, 2,000 tons American tees at a point in New York state, 3,000 tons foreign tees and bridges afloat, and 1,000 tons foreign and American Tees in New York Harbor. Some of these lots are offered at $23@$23.50 for tees, and $23.50 @$24 for double heads.

Scrap.—Market is dull. Yard scrap, $21@$23.

Track Material.—Quotations, $2.25@$2.40 for spikes; 2.10@2.25c. for angle bars, and 3c. for square bolts.

British Iron Trade, First Half of 1887.

The production, as returned by Mr. Jeans, the Secretary of the British Iron and Steel Association, and its comparison with the output of the first half of 1886 and the total production of that year is given below :

	First half of 1887.	First half of 1886.	Total. for 1886.
Pig iron...	3,668,115	3,536,774	6,870,665
Stock of pig iron stored	2,338,670	2,165,505	2,491,500
Blast furnaces in blast.	407	396	375
" out of blast	454	475	...
Bessemer steel ingots..	915,554	713,317	1,570,520
" " rails..	445,785	369,929	730,343

After the increased production the most noticeable feature of the report, and probably the pleasantest to British iron masters, is the decrease in the stock of pig iron stored at the commencement of the year. The stock amounted to 19.4 weeks, or nearly five months consumption. At the end of 1885 the amount was equal to 18 weeks consumption, and at the end of 1884 to 12.7 weeks consumption. At the end of the half year the amount was equal to 16 weeks consumption, which was, including exportations, at the rate of 146,960 tons per week.

Sale of the Northwestern Car Works.

The Court has decided to order the sale of the Northwestern Car Works, of Stillwater, Minn., and to give six weeks' notice of such sale from the time of entering the order, which will be made soon. The plant is to be sold by a referee to be appointed by the Court. The money is to be deposited in a national bank to be designated hereafter. The upset price is placed at $1,000,000.

A Turkish Concession for a Railroad.

It is announced that a concession has been granted by the Turkish government to British financiers for a railroad to Bagdad. The concessionaries are the present lessees of the Haidar Pasha & Ismid Railroad, and it is said that the line will be brought from Haidar Pasha to Scutari. It will be of standard gauge. The *Engineer* sees in this concession a strong desire on the part of the government of Turkey to intrust the future of its railroad extensions to British enterprise, and considers that it opens a fresh field for British industry and skill.

Canadian Canals.

The Canadian canals yielded in 1886 a surplus of $48,754. Grain passed through the Welland Canal destined to the United States to the amount of 165,000 tons (of 2,000 pounds), against 52,000 in 1880. The quantity of grain brought to Montreal by Lake Erie was 198,000 tons less than in 1880. The total freight traffic to or from the United States by the Welland Canal was 511,000 tons in 1886, against 214,000 in 1882.

Wickes Tunnel, Mont.

Under date of 7th inst. advices from the Wickes Tunnel are as follows: "The progress made this week on the north end is 41 ft. of heading, and on the south end is 48 ft. of heading and 38 ft. of bench. This is the best work done since starting, and considering the size of the tunnel, which is 21 ft. × 16 ft. inside of timbers, we think it a creditable showing. If we would not have to timber, we could make 60 ft. per week. The Ingersoll drills and air compressors are working splendidly on both ends of the tunnel."

Heating on the Boston & Providence.

The Boston & Providence evidently proposes to know what is to be known about the various heating systems. We learn that they have equipped or will equip 30 cars with the Gold, Sewell and New York Safety systems, giving 10 cars to each.

Technical Instruction in the Vanderbilt University.

Owing to most liberal endowments of the Vanderbilts, tuition in the regular and complete courses of engineering—civil, mechanical and mining—is made extremely low, while instruction in manual technology and highway engineering is free of charge. The prime object of the courses in manual technology is to teach young men the habits and methods of doing whatever they undertake thoughtfully and rationally, to train them to think about their work, and to work as their thoughts direct, to know the reason, and to have a definite object for every step taken; in short, to install the mind, properly trained, as the ruler of the hand, and to teach it to guide, to ease, and to render more efficient the efforts of the hand. The course extends through two years, and unites contemporaneously class instruction and shop work in subjects closely related. The forenoons are devoted to class work and draughting, and the afternoons are regularly assigned to the several shops in exercises three hours in length.

The Coventry Boiler.

The Coventry locomotive boiler was described in the *Railroad Gazette*, Nov. 6, 1885. This is a return-flue boiler with the smoke-stack at the rear end, between the cab and the dome. A Coventry locomotive is now in regular passenger service on the Louisville, New Albany & Chicago road. It is said to be economical of fuel, and emits no sparks or cinders, and the smoke is very thoroughly consumed.

THE SCRAP HEAP.

A New Alarm.

At last the man who writes to the papers has heard that there are experiments going on with petroleum fuel for locomotives. He asks when the railroads will cease to introduce new dangers and calls on us to imagine what would have happened at Chatsworth if a flood of burning oil had been poured on the wreck. We decline to try to imagine it.

A Great Railroad Centre.

Eight railroads are now either actually being built or soon will be, all to meet at a place where a town has not been laid off even. Big Stone Gap is the name of this remarkable place. It is a great gap in the range of mountains dividing Southwest Virginia and Eastern Kentucky, and of necessity the railroads building in that direction must cross the mountains at this place. It is one of nature's marvels. Just by the side of the river which has broken its way through this great mountain range there is said to be a most beautiful site of 1,200 acres for a town. Here it is proposed to build an industrial town, and with the unlimited supplies of fine ore, and the Elkhorn coking coal and limestone in abundance, this place ought to grow very rapidly under judicious management.—*Boston Journal.*

Steel Rails and Rain.

It is said that "scientific men" in the City of Mexico are studying the phenomenon of increased rainfall in localities where construction is going on, which has been attributed to the large quantities of steel rails going forward on flat cars. First and last, steel rails have done a good deal for humanity, why not increase the rainfall? Perhaps the astute Englishmen knew something about this quality when they projected the Suakim-Berber road.

Texas Dare Devils.

Another train robbery in Texas. This time on the International & Great Northern road near Manchaa, a small station 20 miles south of Austin, and between Austin and San Antonio. A posse of 20 men are after the marauders. The posse may possibly, but not probably, catch them.

Strike of Coal Miners.

An enormous strike of coal miners in the Lehigh districts of the anthracite coal regions in Pennsylvania was begun on Sept. 12. The strike is confined to those portions of lower Luceme and upper Schuylkill counties known as the Lehigh region, and to the Panther Creek Valley between Tamaqua and Mauch Chunk. In these districts nearly every colliery is idle and at least 22,000 workmen are on strike. The demand is for an increase of 15 per cent. in wages.

Old, But Still Fresh.

The Toledo, Ann Arbor & Cardillac Railroad Co. offered an Irishman $300 for his three-years' lease and offered to move his cabin to any place he might designate, having bought the land on which it stood. Pat accepted the offer and took the money, but when the men came on to move the cabin and asked the Hibernian where to move it, he said, "To Oireland." They thought it was a joke, but Pat holds the fort and the $300.

Infantile Criminals.

Two boys, both under 10 years of age, are under arrest in an Iowa town for attempting to wreck a railroad train. We do not know that the little tots could have done anything very serious, but their intentions were of the most sanguinary character. It was their purpose, had they succeeded in the attempt, so they said, to rob the passengers. The idea had been suggested to them by dime novels which they had read. —*Chicago Daily News.*

Helping the Chatsworth Victims.

Two benefit entertainments for the Chatsworth sufferers were given in Peoria, Ill., this week. The committee of women having the matter in charge reported the net proceeds $1.444. The expenses were very light, nearly everything being contributed.

Trains in the Streets of Cities.

The Mayor of Syracuse, N. Y., will direct that legal proceedings be begun against the West Shore road to make the latter account for an accident which occurred in that city last week. A hook and ladder truck in running to a fire was struck by a West Shore passenger train, the men and horses were hurled high in the air and the 8,000-lb. truck was carried several hundred feet and then thrown against a fence as if it were a bit of kindling-wood. It is said the road has habitually violated the municipal ordinances concerning the speed of trains in the city, and that this is the main ground of the city's complaint. The New York *Times* rejoices that the city will probably have ample funds and so have more patience to "fight it out" with the road than private parties generally do in such cases.

Manufacturing in the East.

According to *Bradstreet's*, 200—probably more—new manufacturing enterprises, or new factories, have been started in New England since the first of January. There is no way of coming at the capital invested in these enterprises, but many of them are of large magnitude. They afford all the evidence needed that manufacture in New England is growing at a very healthy rate.

High Pressure.

It is probable the present tendency to increase boiler pressure would have been appreciated by one of the old Erie engineers. "Yankee Dan" was something of a character, and while running on the Falls Branch used to overtake and pass the Central trains on the then parallel track to Tonawanda in a way that surprised their runners; and while Dan was quietly sitting in his cab waiting for time, one of them crossed over to investigate. A glance at the gauge seemed to satisfy him, and he was quietly edging away with the remark: "You carry pretty good steam here, don't you?" when Dan, who had followed his look, replied in an assuring tone. "Oh h——l, that's nothing, its only the second time around."

Powderly and the Railroads.

General Master Workman Powderly has said in an interview that his next annual message would advocate Government ownership of telegraph and railroad lines.

Ten Thousand Dollars for an Arm.

In the case of Joyce Macklem, age fifteen, of Niagara Falls, through his father, John S. Macklem, as guardian, against the New York Central & Hudson River Railroad Co. in the Supreme Court, the jury this week brought in a verdict for $10,000 damages. The action is for injuries received by the boy on Dec. 28, 1886, by having his arm crushed at the elbow. A sleigh load of children were taking a ride. As they crossed the road at the Falls a train backed down upon them.

China.

In the London special dispatch to the *Evening Post* of the 13th inst. is the statement that two English firms are pressing enterprises in China. One firm has two railroad contracts, and another is endeavoring to open up the Yang-tse Kiang to navigation.

English Contracts in South America.

John Jackson, contractor, of Eastbourne and Clements Lane, England, has just signed a contract with the Argentine government to lay about 450 miles of railway. There are three lines: one northward, from Chilcas to Jufuy, 150 miles; one westward, from Dean Fumes to Chelectcito. 250 miles; and a small branch railway from Chumbicha to Catamarcus, about 40 miles. The lines are to be completed in four years, at a probable cost of two and a quarter million pounds. The permanent way is to be of English manufacture.

Tried to Deserve Promotion.

It is rumored that Semaphore Zane or Conductor Turner, is getting himself in trim for a passenger run, as he was seen with his head down in a barrel, hollering all aboard, to see how it sounded.—*Exchange.*

Manitoba.

The province of Manitoba has a surplus of $5,000,000 and no indebtedness. The capital account with the Dominion Government is $4,000,000, from which the province draws interest at 5 per cent. Floating indebtedness does not exceed $100,000. The export of wheat from Manitoba this year will be about 7,000,000 bush. These statements are on the authority of Provincial Treasurer Lariviere.

Averting a Strike.

At a conference held at Pottsville, Pa., Sept. 14, between the Demand Committee of the Miners and Laborers Amalgamated and Reading Coal & Iron Co., an amicable agreement was reached by which a strike in the Schuylkill region will be averted. By the agreement wages are to be advanced eight per cent., beginning from Sept. 1, and this is to continue four months.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Meetings of the stockholders of railroad companies will be held as follows:

Cleveland & Wheeling, special meeting, at the office, Canton, O., Sept. 16.

Chicago & Eastern Illinois, annual meeting, at the office, Chicago, Ill., Oct. 4.

Eastern Illinois & Indiana State Line, special meeting, at the office, Chicago, Ill., Oct. 31.

Louisville & Nashville, annual meeting, at the office, Louisville, Ky., Oct. 15.

Minneapolis & St. Louis, annual meeting, at Minneapolis, Minn., Oct. 4.

Momence & State Line, special meeting, at the office, Chiatgo, Ill., Oct 31.

New York, Chicago & St. Louis, special meeting, 54 Wall street, New York, Sept. 22.

Ohio & Mississippi, annual meeting, at the office, Cincinnati, O., Oct. 13.

Lake Erie & Western, annual meeting, at the office, Bloomington, Ill., Oct. 5.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows :

Lehigh Valley, quarterly, 1¼ per cent.

Manhattan, quarterly, 1½ per cent., payable Oct. 1.

New York, New Haven & Hartford, quarterly, 2½ per cent., payable Oct. 1.

Oregon Railway & Navigation, quarterly, 1½ per cent.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows :

The *Western Society of Engineers* holds its regular meetings at its hall, No. 15 Washington street, Chicago, at 7:30 p. m., on the first Tuesday of each month.

The *National Association of General Passenger Agents*, at St. Paul, Minn., Sept. 20.

General Time Convention, Hotel Brunswick, New York City, Oct. 12.

The *New England Railway Club* meets at its rooms in the Boston & Albany passenger station, Boston, on the second Wednesday of each month.

North American Railroad Superintendents, at the Hotel Brunswick, New York, beginning Oct. 10.

The *Brotherhood of Railway Brakemen*, National convention, at Binghamton, N. Y., beginning Oct. 19.

Western Railway Club.

The next meeting of the club will be held in the Grand Pacific Hotel, Chicago, at 2 p. m., on Sept. 21. The business of the meeting will be :

1st. Election of officers.

2d. "Contract Work in Railroad Shops," to be introduced by Mr. F. D. Casanave.

3d. "The type of car coupler recommended by the Master Car-Builders' Association," to be introduced by Mr. G. W. Rhodes.

Engineers' Club of Minnesota.

A regular meeting was held Sept. 9. Arrangements have been made for an excursion with the St. Paul Club to St. Louis by way of Chicago. Visits will be made to points of interest on the way.

Mr. Fred G. Carser was elected a member. A discussion was had on Mr. Sublette's paper on Railroad Legislation, and Mr. Rigby announced a paper on Light and Gas, to be read at the next meeting.

PERSONAL.

—Ex-Gov. Holly, of Connecticut, is said to be dying of typhoid fever at his home in Lakeville, Conn. He is 83 years old.

—Charles McCabe, General Passenger Agent of the Chicago & Alton on the Pacific coast, died of consumption in San Francisco on Sept. 6.

—Capt. Joseph J. Hendley, formerly of Galveston, Tex., died at Middletown, Conn., on Sept. 14. He was one of the ounders of the Gulf, Colorada & Santa Fe Railroad.

—Austin Corbin, President of the Philadelphia & Reading, is now on a trip to Yellowstone Park, accompanied by his family and a few intimate friends, the party numbering 15 in all. They travel by special car.

—T. Edward Bond, for the past 22 years connected with the Central Vermont road at Boston, also for the last 9 years American agent for the tourist firm of Henry Gaze & Son, of London, has resigned both positions and accepted the office of Secretary of the San Luis Rey Flume Co., a large irrigation and land company, with headquarters at Oceanside, Cal.

—President Frank Leonard, of the unfortunate Toledo, Peoria & Western, said to a representative of the *Railroad Gazette* the other day that the affairs of his company looked more hopeful than at any time since the Chatsworth accident. While the claims for damages were appalling, the directors seemed to have made up their minds that the property is worth saving even at an extra cost of $500,000.

ELECTIONS AND APPOINTMENTS.

Albany & Susquehanna.—The following directors have been elected: Coe F. Young, Honesdale, Penn.; Robert M. Olyphant; James R. Taylor, David Dows, Alfred Vansantwood, Benjamin H. Bristow, Albert Olyphant, New York

City; Horace G. Young and William L. M. Phelps, Albany, N. Y.; Mirard Warder, Cobleskill; George I. Wilbur, Oneonta; James Roosevelt, Hyde Park; Henry M. Olmstead, Morristown, N. Y.

California Central.—John L. Truslow, formerly General Western Passenger Agent of the Atlantic & Pacific, has been appointed General Passenger and Freight Agent of this company, with headquarters at Santa Barbara, Cal.

Chicago, Burlington & Northern.—William E. Green has been appointed Assistant Superintendent; headquarters at Lacrosse, Wis.

Chicago, Milwaukee & St. Paul.—T. Obern has been appointed Roadmaster of the Chicago & Council Bluffs Division, headquarters at Elgin, Ill.

Chicago, Rock Island & Pacific.—E. St. John has been appointed General Manager; A. Kimball, Assistant to the President; Warren G. Purdy has been elected Vice-President.

W. G. Purdy, in addition to the offices of Secretary and Treasurer, has been elected Vice-President, vice A. Kimball. J. T. Phillips, late Cashier, has been appointed Assistant Secretary and Assistant Treasurer.

Cornwall & Lebanon.—Allen D. Hoffer has been elected Treasurer, vice Hugh M. Maxwell, resigned.

Duluth Terminal.—A. N. Miller has been elected President.

East Tennessee, Virginia & Georgia.—W. W. Napier has been appointed contracting agent, headquarters Nashville Tenn.

East & West.—The incorporators of this Tennessee company are F. F. Weihl and C. E. James, of Chattanooga; John H. Clark, of Glenmary; Clairborn Beaty, Bruno Gernt and L. T. Smith, of Fentress County, and E. Blanchard, of Transdale County.

Indiana & Western.—The first board of directors of this Illinois company is composed of the following men: C. W. Fairbanks and C. E. Henderson, of Indianapolis, Ind.: J. B. Mann, E. L. Stuart and W. Beckwith, of Danville, Ill.

Kansas, Missouri, Arkansas & Natchez.—The directors of this new Kansas company are: F. O. Baker, O. E. Baker and T. W Lynn, of Fort Scott: J. L. Tilly, of Shreveport, La.; J. H. Carnell, of Fort Smith, Ark.; T. Stillman, M. W. Clay, John T. McElhaney, A. W. Benton, G. W. Cleveland and F. E. Miller, of Neosho, Mo.

Louisville & Nashville.—Frank Harris has been appointed Master of Trains of the St. Louis Division, headquarters at Mount Vernon, Ill.

Louisville, New Orleans & Texas.—Benjamin Wilson, formerly Receiver of the Mobile & Northwestern, has been appointed Superintendent of this company, office at Memphis, Tenn.

Minnesota & Northwestern.—A. B. Stickney, S. C. Stickney and Morris Auerbach have been re-elected directors. The old officers of the company have been re-elected.

New York, Danbury & Boston.—At the annual meeting in New York this week the old board of directors was re-elected.

New York Underground.—The stockholders have elected the following directors: Edward Lauterbach, Richard Irvin, Jr., Henry Clews, John H. Davis, Heman Clark, Origen Vandenburg, David H. Bates, David Paton, Henry D. Sedgwick, John D. Cheever, C. Francis Bates, William C. Behrens, and Jonathan H. Crane. Of these Messrs. Paton, Cheever, Bates, Behrens, and Crane are new members of the board.

Norfolk & Columbia.—Samuel Conover, New York, is President.

Pennsylvania, Poughkeepsie & Boston.—W. W. Gibbs has been elected President of this company, which is a reorganization of the Pennsylvania, Slatington & New England.

Poughkeepsie, Hartford & New England.—The directors have elected officers as follows: Elverton R. Chapman, New York, President; John I. Platt, of Poughkeepsie, Vice-President; David J. McNeice, Treasurer, and Charles H. Swan, Secretary. Mr. Chapman, George W. Green, of Orange County, and W. R. Carlile, of New York, were chosen as the Executive Committee. A. B. Paine was appointed Chief Engineer.

Sheffield & Birmingham Coal, Iron & Railway Co.—The officers are: E. W. Cole, President; A. Parish, Vice-President; William S. Jones, Secretary; Charles D. Woodson, Treasurer.

Toledo & Ohio Central.—J. S. Stanton W. B. Saunders and A. W. Scott have been re-elected directors. The other directors are Stevenson Burke, C. J. Carda, C. W. Apdike, J. M. Ferris, Charles Hickox and Grinnell Burke.

Union Pacific.—Peter Rockwell has been appointed General Roadmaster, vice W. McLeod, resigned.

OLD AND NEW ROADS.

Alabama Great Southern.—Ewing, Harpe & Baskette, of Chattanooga, Tenn., have received a contract to build stock yards for this company.

Atchison, Topeka & Santa Fe.—Since Jan. 1, 1887, this company has laid 746 miles of new track on its various extensions, distributed as follows: Great Bend, Kan., Extension, from Great Bend, Kan., to Ness City, 67 miles; Augusta, Kan., Extension, 21 miles; Mulvane Extension, Kansas, 87 miles; Colony Extension, Kansas, 14 miles; Ellinor Extension, 7 miles; Arkansas City Extension, 98 miles; Larned, Kan., Extension, 22 miles; Benedict Extension, 27 miles; Kiowa Extension, 136 miles; Burlington Extension, 11 miles; Strong City, Kan., Extension 81 miles; Leavenworth (Northern & Southern), 46 miles; Denver & Santa Fe, 69 miles; Chicago, Santa Fe & California, 35 miles; Chicago, Santa Fe & California, of Iowa, 25 miles.

The company has bought the terminal interest of the St. Joseph & Grand Island, in St. Joseph, Mo., for $120,000.

The company has given to the Pullman Palace Car Co. an order for equipment for eight passenger trains, each train to consist of seven cars. The cars are to be finished in May, and it is said the company will, on the completion of its Chicago line, run through trains between Chicago and Los Angeles, Cal.

Augusta & White River.—The grading on this road, connecting Augusta and Bald Knob, Ark., is completed and the ties down. It will be completed as soon as the rails arrive; they have been bought in St. Louis.

Baltimore & Ohio.—The directors held their monthly meeting in Baltimore this week. William F. Burns presided. Mr. Burns described the features of the loan recently negotiated by the company and London and New York bankers. He stated that the syndicate was not in the interest of any other corporation and that the management of the Baltimore & Ohio would not be hampered by any rival or competitive interest. The earnings of the company for August were $2,084,000, the largest earnings for any month in the company's history.

The Commissioners of the District of Columbia have addressed a letter to this company respecting the Y track connecting the Washington and Metropolitan branches of the road, which has been the scene of so many accidents, stating that after careful examination of the law they are satisfied that the location of this track at this place (being in the public street) is wholly illegal. They say that the company must either limit the use of the Y to freight trains, or else take it up.

Baltimore & Drum Point.—Contracts for the construction of this road from Baltimore through Anne Arundel and Calvert counties, a distance of 75 miles, will be let Oct. 1. Nicholas Goldsborough is chief engineer.

Boston & Albany.—The question of a new passenger station at Springfield still hangs fire, the road being unwilling to move until the separating of grades at Main street is authorized, and the city being undecided whether it wants a street under the railroad or the present dangerous crossing. The road, which at first proposed a large building including the waiting and other rooms and the train house all under one large arched roof, has now brought forward new plans which contemplate two passenger houses, one each side of the main tracks, and ordinary sheds adjoining the tracks, of which there are four. This would seem to perpetuate many of the evils of the old station.

Boston & Maine.—It is said that the results of the operation of this system for the current year ending this month will show the gross income to be $600,000 greater than last year. After making full provision for the requirements of the lease, a balance of over 6 per cent. for the common stock of the Eastern will remain, the bonded debt having now been brought down below $10,000,000, the limit which the law said must be reached before earnings could be applied to dividends.

Mr. Hazen, of Whitefield, N. H., the originator of the bill in the interests of this company, has announced that he will support the opposition or Atherton bill which favors the Concord Railroad. Mr. Hazen gave as his reason for his change of sentiment that the Concord road has given a bond to build an extension from Whitefield by way of Jefferson to Berlin. This would be greatly to the advantage of Mr. Hazen's constituents. The Boston & Maine refused to make a similar guaranty, although Mr. Hazen's support of the bill in that road's interest hitherto was avowedly on the ground that the road would construct the extension referred to.

Buffalo, New York & Philadelphia.—The Buffalo Division of this road was sold last week under the first and second mortgages, according to a decree of the Supreme Court. It was bid in by Carl Schurz, Chairman of the Reorganization Committee, for $3,453,471.

The Rochester division of this road is to be sold next week, and it is stated that the Delaware, Lackawanna & Western will buy it. The division extends from Rochester to Olean, over 70 miles.

Cape Girardeau & Southwestern.—The road is to be at once extended from Wellsdale, Mo., to Lee.

Chicago & Indiana Coal Road.—This company is said to be largely increasing its facilities for reaching the block coal mines in Clay County, Ind., and expects to be shortly hauling north from these mines from 100 to 125 car loads a day.

Chicago, Milwaukee & St. Paul.—The shops at Yankton, Dak., were burned last week. Loss, $60,000.

Chicago & Northwestern.—The company has about completed its Dcland (D. T.) extension to Groton, on the Chicago, Milwaukee & St. Paul.

It is reported that the road is materially curtailing its construction operations in Nebraska, Dakota and Wyoming.

Chicago, Rock Island & Pacific.—The track on the extension from Fairbury to Belleville, Kan., has been completed. The grading on the line from Belleville west is completed to the Jewell County line. Tracklaying on the line from Topeka to Belleville has begun.

Chicago, Santa Fe & California.—Twenty-four miles of track have been laid east and west out of Carrollton, Mo. The work on the bridge at Sibley is progressing rapidly. The masons have about finished their work, and the superstructure is now being put in. All material is on the ground and the small bridges along the road are being put in. It is expected the line will be finished by Dec. 1.

Chicago, St. Louis & Paducah.—The location of the second division of this road was completed last week, and the contract for grading has been awarded to N. W. Irish, of Carlyle, Ill. The work on the first division of 15 miles now under contract is progressing rapidly. Anderson, Bradley & Co. are now laying the track on the 10 miles between Marion and Creel Springs, Ill. It is intended to have the whole line from Marion to Brooklyn, opposite Paducah, Ky., under contract this fall.

Cincinnati, Hamilton & Dayton.—A petition has been filed in Hamilton, Butler Co., O., asking that a receiver be appointed to take charge of this road. George K. Duckworth is the plaintiff. He states that he is owner of 250 shares of common stock.

At the meeting last week it was decided that expenses should be cut down $70,000 per year, half of which is to come off the salary list.

Cleveland & Canton.—The ties will be in place for the change to standard gauge by Dec. 1. A new station will probably be built at Cleveland next spring.

The company intends building a road 1½ miles long, from Coshocton, O., to the anthracite coal fields.

Clinch Valley.—H. Davin, of Lexington, Va., has received a contract for building part of this road, including two tunnels and four or five bridges.

Columbus, Lima & Northwestern.—Work on the survey of this road is progressing between Lima and Bellefontaine, O., the citizens of the latter place having agreed to give $100,000 toward building the road.

Dallas, Archer & Pacific.—It is said that this company has changed its plans and will first build its road from Justin, Tex., on the Gulf, Colorado & Santa Fe, to Decatur, 22 miles, and later on extend from Decatur to Archer.

Dallas & Waco.—The company has filed a mortgage in favor of John F. Dillon and Henry B. Henson, trustees, for $1,800,000.

Decatur & Western Nebraska.—Incorporated in Nebraska to build a road from Decatur to the west line of the state.

Delaware, Lackawanna & Western.—Vice Chancellor Van Fleet, of New Jersey, has filed an opinion in the case of this company against the Central Stock Yard and Transit Co., of Jersey City, in which he denies the application for an injunction to compel the defendants to receive at their yards live freight carried over the complainant's road and consigned for delivery at the Central Stock Yards.

Denver & Rio Grande.—The company is now laying a third rail between Pueblo and Trinidad, Col., 90 miles, to accommodate the trains of Denver, Texas & Gulf road.

Denver, Utah & Pacific.—This road, recently purchased by the Chicago, Burlington & Quincy, will be extended to the Colorado line. The right of way has been obtained and the money subscribed.

Durham & Northern.—The town of Durham, N. C., has voted a subscription of $100,000 to this company. The road is designed to give connection with the Seaboard & Roanoke.

East & West.—This company has been organized in Tennessee to build a line from a point in Scott or Morgan County, Tenn., on the Cincinnati Southern to a point on the Cumberland, near Carthage, with a branch south to connect with the Tennessee Midland and another branch north into the coal field on the Kentucky state line.

Evansville & Indianapolis.—The road is built along the line of the old Wabash & Erie Canal from Evansville to Terre Haute, Ind. The canal was abandoned by its trustees 25 years ago and the land reverted to its former owners. Notwithstanding this, the canal's trustees sold the property, rights and franchises to Mackey, of Evansville, and he sold to the railroad company. The farmers refused to let the road go across their farms. J. C. Palmer, one of them, has a perpetual injunction against the company to prevent it from running trains over his land. And now he is arresting the train hands from day to day for persisting in doing this, and he seems to be in a fair way to stop the operations of the road. He now has a number of conductors, engineers and brakemen under bonds.

Fitchburg.—This road is building a repair shop and an enginehouse of 10 stalls at Williamstown, Mass. The work of uniting the Troy & Boston and the Boston, Hoosac Tunnel & Western into one double-track road is progressing. Near North Pownal, Vt., the double tracks through a rock cut overlap each other, and trains will be run over this portion by fixed signals. An iron bridge on a portion of the Troy & Boston that is abandoned will be taken down and used in another place.

The arc lights and wires are to be taken out of the Hoosac Tunnel. The question of lighting the tunnel, which will probably be by the incandescent system, if done at all, hinges on the question of cost.

Freeport, Dodgeville & Northern.—Work began last week on this road at Dodgeville, Wis. It is expected that grading will be finished by December.

Garden City Nickel Plate.—The contract has been closed with a construction company for the building of the road from Garden City, Kan., to some point on the Denver, Memphis & Atlantic in Ness County, to be completed and the cars to be running by June 30, 1888. It is the first diagonal road in western Kansas.

Georgia.—Bills have been introduced in the Georgia legislature to incorporate the Savannah, Vernonsburg & Rose view and the Rome Belt railroad companies.

Illinois Central.—The company is pushing work on its Iowa extensions, especially the Cherokee & Dakota. The grading of the Onawa branch is nearly completed.

Indiana, Bloomington & Western.—The Purchasing Committee has issued a circular stating that the reorganization plan cannot be perfected before next January. Counsel have advised the formation of a separate company in each of the three states, then consolidating the Illinois and Indiana companies, and afterward consolidating this last company with the Ohio company; after this to proceed to consolidate the new Indiana, Bloomington & Western with the Cincinnati, Sandusky & Cleveland.

Indiana & Western.—Articles of consolidation have been filed in Illinois by the Indiana Railway Co. and the Pekin & Danville under the above name. Capital, $11,425,000.

Intercolonial.—Fleming & Sons, St. John, N. B., have received a contract for building 16,000 ft. of snow sheds at St. Fabien, P. Q., on this road.

Kansas City, Independence & Park.—This road of 12 miles, from Kansas City, Mo., eastward to Independence, is completed and ready for operation. It was built by J. D. C. McDonald.

Kansas, Missouri, Arkansas & Natchez.—This company has filed a charter in Kansas. The proposed road is to begin at Cherryvale, Montgomery County, thence in a southeasterly direction through Labette and Cherokee counties to Baxter Springs, thence through the southwestern part of Missouri into the state of Arkansas, thence south and southeast through Arkansas and Louisiana to Natchez, Miss. Estimated length of line, 500 miles. Capital stock of company, $10,000,000. Headquarters, Baxter Springs, Mo.

Kings County Elevated.—The engineers has just completed plans for the bridge and ferry connections in Fulton street, Brooklyn. The foundation for the elevated structure are nearly all laid to the ferry and the work of putting up the iron work has reached Flatbush avenue, the beginning having been made at Grand avenue.

Lake Erie & Western.—Last week the Chicago, St. Louis & Pittsburgh built a connection from its track across Lake Erie & Western ground, in Kokomo, Ind., intending to put in a crossing. The Lake Erie people have now got a locomotive fastened down to the track to prevent the crossing being made.

The extension from Bloomington to Peoria, Ill., will be completed by Nov. 1.

Louisville & Nashville.—Cross & Montgomery have received the contract to build the shops at Decatur, Ala. They will cost $350,000.

Louisville, New Albany & Corydon.—Application has been made for the appointment of a receiver for this road. The road extends from Corydon, Ind., 8 miles to a junction with the Louisville, Evansville & St. Louis.

Louisville, New Orleans & Texas.—All the freight conductors on the South Division of this road telegraphed their resignations to the Master of Transportation this week. The action was caused by the new scale of wages, which pays the men by the trip instead of by the month, as heretofore.

Lynchburg, Halifax & Durham.—Work was begun at Lynchburg, Va., on Sept. 12. The road will run from Lynchburg to Durham, N. C. The contract for building the

first 10 miles has been let to J. A. Serpell & Co., of Louisville, Ky.

Macon, Tuskaloosa & Birmingham.—Incorporated to build a road from Macon, Miss., via Tuskaloosa to Birmingham, Ala. Capital stock, $200,000.

Marietta, Columbus & Northern.—Surveys are now being made for the extension from Sharpsburg, O., to McLuney's station on the Cincinnati & Muskingum Valley, about 30 miles.

Memphis, Arkansas & Texas.—The Richmond Terminal Co. will build this road and expects to get to work at it by December next, the company now being engaged in building the Mobile & Birmingham. The Memphis, Arkansas & Texas will run from Memphis, Tenn., to Forrest City, Ark., thence through Searcy and Harrison to Galena, Mo.

Michigan Central.—This road has opened its station at London, Ont. The company has built station and terminal buildings in that city and runs trains over the Grand Trunk track from St. Thomas.

Minneapolis, Sault Ste. Marie & Atlantic.—The company has commenced running passenger trains from Minneapolis, Minn., to Gagen, Wis., 231 miles. There will be one train a day each way.

Mississippi River, Faribault & Northwestern.—The surveyors are making a preliminary survey of this road between Faribault and Wilmar, Minn.

Missouri Pacific.—The contracts for grading and bridging this road, from Warwick, Kan., to Hastings, Neb., have been let, and active operations have already begun.

Nashville, Chattanooga & St. Louis.—This company has made surveys for the 20-mile extension of its Nashville & Tuskaloosa branch from Dickson to Ætna, Tenn.

New Roads.—A line is being surveyed from Savanna, Carroll County, Ill., to Warren, via Pleasant Valley. Another line is being surveyed from Freeport, to Galena, Ill. It is not known what companies are making the surveys.

New York, Lake Erie & Western.—A master has been appointed to settle the differences between this company and the Shenango Valley, and the Lake Shore & Michigan Southern in the matter of laying certain tracks in Sharon, Pa. In the meantime all parties are to remain neutral. The Shenango Valley road has secured entrance and is building a bridge over the Shenango River.

New York, New Haven & Hartford.—The committee appointed to attend to depot matters in Hartford has rejected all the designs which were under consideration at New Haven this week. Shapley & Co., of Boston, presented a design that was eminently satisfactory, but to carry it out would cost $400,000, and the company wishes to expend only about $150,000.

The four-tracking of this road will be completed to Mamaroneck, N. Y., by Oct. 1.

New York Underground.—Counsel of this company will apply to the Superior Court for a mandamus to compel General Newton, Commissioner of Public Works, to grant a permit to begin work. This is the route from City Hall Park through Centre and Mulberry streets, Fourth avenue, Union Square and Madison avenue.

Norfolk & Columbia.—The company is to build a line from Norfolk, Va., to Columbia, S. C.

Norfolk & Western.—The company has contracted with Cramp & Sons, of Philadelphia, Pa., for a steam collier which will carry 2,400 tons of coal and make 13 knots an hour. She will be used between Norfolk, Va., and New England points.

Oregon Railway & Navigation Co.—This company with the Union Pacific and Oregon Short Line, have put dining cars on the through trains between Portland, and Omaha, and have cut down the time to three days, a reduction of 20 hours.

At Garfield, Wash. Ter., a gang of laborers from the Spokane & Palouse Railroad construction force tore up this company's tracks and put in a crossing, and are now guarding it.

Pacific.—Commissioner Johnston has submitted his annual report to the Secretary of the Interior, giving a summary of the accounts of the various roads covered by the law. Of the Union Pacific Railway the report says that $23,328,760 has been received from the sales of Government lands. There were 7,059,207 acres, valued at $14,004,270, still unsold at the end of the year 1886. The total funded debt of the road on Dec. 31, 1886, is shown to have been $115,508,639, an increase of $11,445 over the preceding December. The total earnings were $24,141,740; total expenditures, $20,011,766, and net earnings, $4,129,974.

The earnings of the company as given above exceed the company's statement by $198,699, which represents the earnings from Pullman cars. The expenditure on account of new construction included in the above, is less than the company's statement by $5,888,697, the construction of the Omaha bridge not being considered by the Commissioner as new construction. The amount given in the report as due the United States exceeds the company's statement by $141,746. These changes were made in accordance with decisions of the Supreme Court.

The total debt of the company on Dec. 31, 1886, is given as $159,499,737, which is a net decrease of $1,700,712 over the preceding December. The capital stock of the company being $60,868,500, the total stock and debt amount to $220,368,247. The assets are given as $257,592,821, a net increase over last year of $3,412,810. The surplus at the end of the calendar year was $37,224,573, as against $32,111,051 of the year before. The estimated amount found due the government on the year's account from the Union division is given as follows:

Five per cent. of net earnings	$137,379
One-half of amount of government transportation	340,174
The same, applicable to sinking fund	340,174
Total	$817,727

The estimated amount due from the Kansas division is $132,052, making a total from both divisions of $949,779. Reports of the Treasury Department show settled accounts and money paid into the treasury, Dec. 31, 1886, amounting to $22 003,053, or $456,670 less than the amount claimed by the company.

The report says of the Central Pacific that the company has acquired by patent 2,402,584 acres of land and sold 2,086,584 acres, and have received from all sales $7,318,478. There are still 315,800 acres owned. The total amount of capital stock issued is $68,000,000, an increase during the year of $5,391,200. The funded debt is $31,697,000. The revenue for the last calendar year was $16,052,448 and the surplus was $953 692.

In regard to the sinking fund of the Union and Central Pacific companies, the report states that the United States Treasurer has $6,921,608 to the credit of the Union Pacific and $3,402,947 to the credit of the Central Pacific. There remained in the United States Treasury Dec. 31, 1886, uninvested $73,654 to the credit of the Union Pacific and $2,343,984 to the credit of the Central Pacific. The amount found to be due to the Government for the year 1886 is $418,271.

The total liabilities of the Sioux City and Pacific are $7,283,636, of which $2,063,400 is capital stock. The assets are $5,823,836, leaving a deficit of $1,459,800.

The Central Branch, Union Pacific (leased to the Missouri Pacific), received from the sale of lands $49,302, and there are outstanding on time sales $79,372. The total liabilities are $6,836 479, which includes $1,000,000 capital stock. The assets are $4 933 878.

The report says that it was impracticable to inspect the Northern Pacific road. The total liabilities are $85,158,484 and the capital stock is $86,936,766. The total assets are $173,179,220, leaving a surplus of $1.085,968.

The report is submitted without recommendation or comment.

David T. Littler, of the Pacific Railway Commission, began this week, in Chicago, an investigation into the affairs of the Sioux City & Pacific.

Pennsylvania.—Extensive developments of anthracite coal lands in the Schuylkill region are being made to furnish tonnage to the Schuylkill branch of this company. The Shenandoah branch will be ready for coal shipments by Dec. 1.

John Taylor, of London, has come to this country and is now in Philadelphia, consulting with large holders of Pennsylvania stock, with reference to applying for an increased rate of dividends. He represents 300 of the large holders of stock in England.

It is reported that the company is surveying in Middlesex and Monmouth counties, N. J., with the view to finding the best location for a line between its road and Long Branch. A line is being located which will cross the Raritan near Florida Grove and run southeast in almost an air line to Red Bank and Long Branch, and thence down the coast to Point Pleasant. The contract by which the Pennsylvania has an interest in the New York & Long Branch road expires, it is said, in 1890.

The Jersey City Board of Aldermen has passed an ordinance giving the Jersey City & Bergen Railroad Co. permission to lay tracks in First street. The company is controlled by the Pennsylvania, and the granting of the ordinance looks as if the company intended to carry out its threat to build a ferry at the foot of First street unless it is allowed to elevate the present tracks.

A new round-house, machine shop, and five locomotives belonging to this company were destroyed by fire at Lewiston, Pa., on Sept. 11. Loss estimated at $65,000.

The Pennsylvania, Slatington & New England has been reorganized under the above name. The road to be built by the company will run from Slatington, Lehigh County, Pa., to the Poughkeepsie Bridge.

Peninsula, of Lower California.—The survey on this road from San Carlos City to San Diego, Cal., and Yumas, A. T., has been begun. The contractor for the building of the road is "The International Company." Two other lines will also be built by this company in the Peninsula, one southeasterly, crossing the Sonora road near Magdalena and the Mexican Central at Chihuahua, thence to Matamoras on the Rio Grande.

Pittsburg Junction.—This road, connecting the Baltimore & Ohio and Pittsburgh & Western, is to be extended along the Allegheny River water front. There will be $1,000,000 issued in stocks and bonds, the security for which will be the addition of the road and 30 acres of land once known as Wainright's Island. This will be accomplished by a new company, to be called the Pittsburgh Junction Terminal Co.

Philadelphia & Reading.—A Philadelphia dispatch says that this road has now a large traffic in coal from its mines to Baltimore, Washington and other places on the Philadelphia, Wilmington & Baltimore road. This is a result of the friendly relations now existing between this road and the Pennsylvania. The other coal shipments from the mines on the Reading road are also heavy and the supply of cars is entirely inadequate, calls for 500 to 1,000 having to go unfilled every day.

Poughkeepsie, Hartford & New England.—At a meeting this week the plan and surveys for this road, which is projected to run from Poughkeepsie, N. Y., to a connection with the Hartford & Connecticut Western, 28½ miles, were approved.

Port Townsend & Southern.—This company has been incorporated at Port Townsend, W. T., to build a road from that place to Portland, Oregon.

Raleigh & Gaston.—The company will build a line from Henderson to Franklinton, N. C.

Red River Valley.—The Dominion government has filed two bills of complaint against Premier Norquay; the Hon. Doctor Wilson, Minister of Public Works for Manitoba, and the contractor of the Red River Valley road to restrain them from further trespass on certain lands over which the road must pass. These lands are crown lands. An injunction will be moved for in a few days.

For some time a large quantity of steel rails has been lying on the wharf at Montreal awaiting funds to pay for them. The treasurer of Manitoba has been trying to raise the necessary money, and has just now obtained a loan of $50,000 from the Seminary of St. Sulpice, a Roman Catholic institution. A quantity of rails sufficient to lay 15 miles of track have been shipped to Manitoba.

Ripley & Mill Creek Valley.—This road has been graded from the mouth of Mill Creek on the Ohio River to Ripley, W. Va., 12½ miles. A. J. Vosburgh, Jackson, W. Va., is chief engineer.

St. Johnsbury & Lake Champlain.—New depots are to be built at East Fairfield, Fairfield, Highgate, East Highgate and Sheldon, Vt. A new freight house is being completed at Cambridge Junction, and other improvements are contemplated.

St. Louis, Arkansas & Texas.—The Little Rock branch is progressing rapidly. All the contracts have been awarded. It is stated that trains will be running into Little Rock by Dec. 1.

This company has filed two mortgages of $7,540,000 each, one in favor of the Central Trust Co., and the other in favor of the Mercantile Trust Co., of New York. It is specially stated in these mortgages that they apply to the extension to be built from Sulphur Springs to Fort Worth, the Sherman Branch and a branch of 120 miles long to be built from Chandler to Fort Worth, Tex.

St. Louis, Iron Mountain & Southern.—Contracts have been let for the grading of the Fort Smith branch of this road from Fort Smith, Ark., to Backbone Mountain. This section will be built right away, and contracts will soon be let for grading to Waldron, Ark.

St. Paul, Minneapolis & Manitoba.—This company's extension has reached Fort Assiniboine, M. T. The garrison and band turned out to welcome the tracklayers.

The track of the Leeson and Watertown, Dak., Extension has been laid to the latter city, 91 miles.

San Diego & Old Town Electric.—On account of delay in obtaining electric motors this California company will put on steam motors temporarily and will open the road within 30 days.

Seashore Electric.—A successful trial trip has been made over this road at Asbury Park, N. J., and in a few days trains will be running regularly.

Seattle, Lake Shore & Eastern.—Active work has been in progress on this road since spring, and 30 miles are now ready for tracklaying. The road is projected from Seattle, W. T., to Walla Walla, with a branch from the latter place to Spokane Falls.

Sheffield & Birmingham Coal, Iron & Railway Co.—Under this name the Alabama & Tennessee Coal & Iron Co. and the Sheffield & Birmingham Railroad Co. have consolidated. Capital stock, $8,255,000.

Somerset.—The survey and location of this road are completed from North Anson, the present terminus of the main line, to Bingham, Me., 16¼ miles.

A company is surveying a road from Friend to Fairbury, Neb.

Eight miles of track have been laid on the suburban dummy railroad of Nashville, Tenn. Cars will be running by the middle of next month. The Baldwin Locomotive Works will supply the motors for this road.

Southern Kansas.—The company announces its Kiowa Extension open for business as far as Canadian, Tex., 143 miles from Kiowa.

The Colony, Neosho Falls & Western branch of this road has been extended from Neosho Falls, Kan., southwest to Yates Centre, 13 miles.

Southern Ohio River.—The road is completed and open for freight business from Lawrenceburg to Rising Sun, Ind.

Southern Pacific.—The company is receiving cargoes of steel rails daily, and will lay a large amount of new track this month. On its various extensions there are more than 100 miles of grading awaiting the track.

The storm of last week in Arizona and Mexico was one of the most disastrous to railroads on record. A Tucson (Arizona) dispatch of Sept. 13 says: The extent of the destruction to railroads is much greater than first supposed. It extends at intervals from the Colorado River to the Dragoon Mountains east of Benson. The washed out places between Benson and Tucson will take three weeks to repair so that trains can pass over. Eastern passengers detained here will be transferred overland by coaches to-day. No trains from the East or West have arrived since Thursday night. The present is the most destructive washout ever suffered by the Southern Pacific, and it will cost not less than $200 000 to repair the damage. A through wire to the East was made to-day. The heavy rains yesterday extended into Sonora, where five miles of track and three bridges were washed out on the Sonora road. The streets of Tucson are flooded with perishable freight for the Eastern market. A large quantity was sold by the railroad company.

Another dispatch states that whole miles of the road-bed are washed out to such an extent as to completely destroy it.

Texas & Pacific.—The company has entered into an arrangement with the Cromwell Steamship Line, plying between New Orleans & New York, so as to handle freights east and west bound.

Track is being laid between Sweetwater and Colorado, Tex.

Connection has been made between the tracks of this company and the Fort Worth & Rio Grande's in Fort Worth.

Toledo, Ann Arbor & North Michigan.—Work is progressing on the extension of this road, from Mt. Pleasant, Mich., to Cadillac, 68 miles. More than 35 miles of track are now laid, and it is expected to have the road in operation by the last of November. A line is also being built from Mt. Pleasant to Sherman City, 18 miles.

Underground, of New York.—The Rapid Transit Commission has refused to allow a change of the route of this road from Centre to Elm street, and from under City Hall Square to Park Row.

Union Pacific.—The company is said to be contemplating the construction of a branch from Manhattan, Kan., via Marion to Newton, and thence southwest. A preliminary survey is now being made.

The company is having a survey made for a line from Denver to Leadville, Col., via Clear Creek Cañon and Keystone.

Washington & Idaho.—This road is being pushed by the Oregon Railway & Navigation Co., into the Cœur d'Alene region. Rapid progress has been made between Mullane and Wallace, Idaho, and the ultimate intention was to build through to Butte, Mont. The Cœur d'Alene Railway & Navigation Co. will soon have its track into Wallace. This company has secured a temporary injunction against the Washington & Idaho, and stopped the latter's work.

Winona & Southwestern.—The company has let a contract for building a road from Winona, Minn., to Omaha, Neb., 330 miles, and $200,000 has been deposited as security for the performance of the contract.

Negotiations are now progressing looking to the construction of this road. The plan contemplates the purchase of the Mason City & Fort Dodge line, the road to be made part of a through system from Winona to Omaha.

Wisconsin Central Co.—The organization of this company, formed for the purpose of buying securities of the various roads in the Wisconsin Central system, and thus insuring their management as a unit, is practically completed, nearly all the securities coming in for exchange.

TRAFFIC AND EARNINGS.

The Interstate Commission.

The Commission held a brief meeting in Minneapolis Sept. 13, at which argument was heard in the complaint of E. B. Raymond, of Mazeppa, Minn., against the Chicago, Milwaukee & St. Paul, charging discrimination in rates against that place in favor of Red Wing, St. Paul and Minneapolis. Testimony of prominent millers and railroaders was taken on the workings of the milling in transit system. The Chicago, Milwaukee & St. Paul was given twenty days to submit a reply to the charges against it.

The Commission will go to Boston to hear the case of the

Boston Chamber of Commerce against the Boston & Albany concerning discrimination in export freight, but the date of the hearing has not yet been announced.

Complaint has been made concerning the conduct of the Trunk Lines' joint emigrant agency at Castle Garden, New York. The charges, as stated in the reports of the hearings that have been given at the Custom House in New York to aggrieved parties, seem to be very indefinite, the only tangible one being that extra baggage rates are excessive. Commissioner Pierson says that a revised extra baggage tariff, in which emigrants will be accorded lower rates than first class passengers, has been in preparation several months and is to be issued next month.

East-bound Shipments.

The shipment of flour, grain and provisions from Chicago eastward to seaboard points amounted last week to 25,651 tons, against 25,975 tons for the week previous, a decrease of 324 tons The percentages carried by the different roads are as follows: Chicago & Grand Trunk, 8.6; Michigan Central, 33 1; Lake Shore and Michigan Southern, 13 9; Pittsburg, Fort Wayne & Chicago, 18.9; Chicago, St. Louis & Pittsburgh, 5.6; Baltimore & Ohio 10 5; New York, Chicago & St. Louis, 9.2; Cincinnati, Indianapolis, St. Louis & Chicago, 0.2.

Railroad Earnings.

Earnings of railroad lines for various periods are reported as follows:

Month of August:

	1887	1886.	Inc. or Dec.	P. c.
Atch., T. & S. F.	$1,481,261	$1,341,951	I $139,310	10 3
Atlantic & Pac....	185 947	136,353	I. 49,594	36.3
Buff., N. Y. & P..	285,000	257,734	I. 27,266	10.6
Buff., R. & Pitts.	183,903	13 ,097	I. 5?,806	40.2
*Bur., C. R & No.	151,774	164 744	D. 12,970	7 8
Cairo, V. & Chic.	77 631	60.777	I. 16.854	27 7
California South.	99,430	63,761	I. 35,669	55.9
Canadian Pac. ..	1,018,000	922,133	I. 95 867	10.3
Central of Iowa...	112.091	117,022	D. 4,931	4.2
Ches., O. & S. W..	178,222	147,399	I. 30.823	20 9
Chic. & Atlantic..	189 245	144,255	I. 45.990	32.0
Chi. & East. Ill..	184,041	166,196	I. 17 845	10 7
Chi., Mil. & St. P.	2,008,000	1,971,792	I. 36,401	1.8
Chi. & W. Mich..	119. 13	117 945	I. 1,268	1 0
C., I., St. L. & C..	231,901	2 6,482	D. 4 581	1 9
C., J. ck & Mack.	50.227	35,920	I. 14,307	39 8
*Cin., N. O.&T. P.	169,079	163,255	I. 5,824	3.5
*Ala. Gt. South	77 587	60,241	I. 17 346	28 8
*N. Ori. & N. E.	24 410	20,422	I. 3 988	19.5
*Vicks. & Mer..	22.014	22,903	D. 889	3.7
*V., Shre. & P.	22,297	23,081	D. 784	3 3
Cin., R. & Ft. W..	38,299	36,713	I. 1,586	4.3
Cin., W. & Balt..	218 632	183,373	I. 25,259	13 7
*Cleve., Ak. & Col.	33 519	38,424	D. 4 905	12.7
Cleve. & Marietta	25,945	21,175	I. 4,770	22.5
Col. & Cin. Mid..	34,923	33,617	I. 1,306	3 8
Col., H. V. & T..	240,452	211,406	I. 29,046	13 7
Den. & R. Grande	709 000	614,629	I. 94 361	15.3
*Den. & R. G. W .	69,200	57 4 0	I. 11 755	20.4
Det., B. C & Al..	52,238	23,085	I. 29, 53	126 2
Det., Lan. & No..	101 666	100.971	I. 695	.6
*E. Ten., Va. & G.	274,704	235,182	I. 39,522	16.7
Evans & Ind.. ...	27,323	24,791	I. 2,532	10.2
Ev & Terre H	81,448	91,702	D. 10 254	11.1
Flint & Pere Ma.	216,443	168,92	I. 47,518	28 1
Fla. Ry & N. Co.	64,153	61,240	I. 2,913	4.7
Ft. W. & Den. C..	66,573	37,599	I. 28,974	77.0
Gr Rapids & Ind.	228,863	200,865	I. 28,998	14 4
Grand Tr. of Can.	1,468.159	1,397 670	I. 70,489	5 0
*Houston & T. C.	167.008	166,944	I. 64	.0
Ill. Cen. (Ill. Div.)	627,300	669,619	D. 41,719	6.2
South Div.	280,800	277,791	I. 3,509	1.2
Cedar Falls & M..	12 300	15,870	D. 3,570	22.4
Dub. & Sioux C ...	77,000	85 714	D. 8,714	10.1
Iowa F. & S. City	57 900	56,019	I. 1,881	3.3
Ind., Bloom. & W..	256,765	257,522	D. 757	.2
Ind., Dec. & Spr..	40,448	48,919	D. 8,491	17.3
*K. C., Ft S. & G.	127 914	121,297	I. 6.617	5.4
*K. C., Sp & Mem	96.080	81,845	I. 14,235	17.4
*K. C., Cl & Spr..	12,958	12,719	I. 239	1.8
Ke k. & West	30,870	28,207	I. 2,663	9 4
Kings & Pemb....	16,253	13,526	I. 2 727	20.2
Lake Erie & W....	208,755	192,248	I. 16 507	8 5
Lehigh & H. R....	23,143	20,813	I. 2,330	11.2
Long Island	428,991	404,798	I. 24. 93	5.9
Lou., Ev. & St. L.	95,088	81,909	I. 13 179	16 0
Louv & Nash....	1,357,985	1,200,567	I. 157 418	13 1
Louis., N. A. & C.	207,390	182 6 3	I. 24,767	13.5
L., N. O. & Tex..	130 059	109,180	I. 20.879	19 1
M. , Col. & Nor..	7,189	2,624	I. 4 565	175 5
Marq., H. & Ont..	141.039	141,799	D. 760	.5
*Memphis & Chas	103 139	78,579	I. 24,560	31.2
†Mexican Cen	379,000	270.091	I. 108,909	40.3
*†Mex. No. (S. Div.	54 804	64,370	D. 9 566	14.8
Mil., L. S. & W..	356,627	251,450	I. 105 177	41 8
Mil. & Northern..	83,541	55 981	I. 27.560	49.0
Minn. & North.W.	171.574	45,804	I. 125,770	274.6
Mobile & Ohio	194 075	147,935	I. 46,140	31.1
N. Y. C. & H. R..	3,334,321	2,980.974	I. 351 347	11.7
N. Y., Ont. & W.	170,252	146,660	I. 24 592	17.4
Norfolk & West..	351,001	269,321	I. 81.680	30.3
Northern Pacific..	1,256 100	1,226,358	I. 29.742	2.4
Ohio & Miss	405 756	378,100	I. 27.656	7 3
Ohio River	41.761	22,330	I. 19,431	87.1
Ohio Southern	47 201	46,355	I. 846	1.8
Peoria, Dec. & E.	79,411	90,778	D. 11.367	12.5
Pitts & West. ..	191.500	150,249	I. 41,251	27.4
Rich. & Danville..	368.900	331,088	I. 37,812	11.1
Va. Mid. Div...	148,600	147,600	I. 1,000	.6
Chas., C. & A..	53,600	51,573	I. 2,027	3.8
Col. & Gr. Div..	37,400	37,547	D. 147	.3
West. N. C. Div.	55,500	49.189	I. 6.311	12 8
Wa., O. & W..	15,000	14,700	I. 300	2.0
Ash. & Sp. Div.	8,000	6,100	I. 1 900	31.1
St. Jo & Gd. I..	79 791	105,667	D. 25,876	24.4
St. L., A. & T. H.:				
Main Line.....	129.971	113,867	I. 16,104	14 1
Branches	81,501	72,006	I. 9,495	13.1
St. L. A. & Tex..	217,115	145,247	I. 71.868	49.4
St. L. & San F....	577,384	460,048	I. 117,336	25 5
St. P. & Duluth...	161,253	156,452	I. 4 801	3.0
St. P., M. & Man..	684,934	627,764	I. 57.170	9.1
Shenandoah Val.	84,000	80,000	I. 4,000	.5
Staten Is. R. T....	117 052	116 691	I. 361	.3
Texas & Pacific...	460 644	443,511	I. 17,133	3.8
Tol., A. A. & N. M.	49.420	38,279	I. 11,141	29 0
Tol. & Ohio Cen..	93.714	70, 91	I. 23,323	33.1
*Tol., P. & West..	56 701	55,465	I. 1 236	2.
Valley (Ohio).....	54,844	51,059	I. 3,785	7.4
Wabash (West)..	668,175	494,472	I. 173,7 3	35.1
Wheeling & L. E.	65,914	54 747	I. 11, 67	20 4
Wisconsin Cent...	180 822	117,846	I. 62 976	53.4
C., W. & Min ...	59,672	27,114	I. 32,558	120.1
Min., St C. & W.	39,283	27 994	I. 11,289	40.3
Wis & Minn...	25 331	17,598	I. 7,733	43 9
Total	$27,010,232	$24,154,500	I. $2,855,732	11.8

Month of July:

	1887.	1886.	Inc. or Dec.	P. c.
Ches. & Ohio....	$389,081	$405,509	D $16,428	4 0
Eliz., Lex. & B. S..	98 980	95 846	I. 3,134	3 2
Chi., Bur. & Q....	2,167.801	2,330,741	D. 162,940	6.9
Chic. & N. W	2,249 484	2,146,493	I. 102,991	4 7
C., St. P., M. & O.	541,486	493,863	I. 67,623	13.6
Georgia Pacific...	100,589	59 6 1	I. 40,948	68.7
Gr. B., W. & St. P.	39,576	24,822	I. 14,754	59 4
Jack., T. & K. W.	24,822	16.613	I. 8,209	49.4
Kentucky Cent ..	101,868	95 681	I. 6,187	6.4
Miss. & Tenn. ..	23,961	23,541	D. 580	2 4
N. Y., L. E. & W.	1.782,991	1,596,195	I. 186,796	11.0
N. Y., P. & Ohio.	512,072	572,311	D. 60,239	10.5
Rich. & Peters ..	18,666	16 839	I. 1,827	10.8
Scioto Valley.....	69.335	56 745	I. 12,590	22.2
South Carolina....	75,390	74,777	I. 523	.7
Wab., E. of Miss..	638,573	545,601	I. 92,972	17.0

Month of June:

	1887.	1886.	Inc. or Dec.	P. c.
Atlanta & Charles	84,140	72,746	I. 11 394	15 6
Central Pacific...	1,171,887	1,025,274	I. 146 613	14.2
Charles & Sav....	35,100	31,687	I. 3,413	10.7
Chicago & Atl....	717,190	637,484	I 79,706	12.5
Chic., Burl. & N..	202.637	.....	.....	....
Chi., Bur. & Q. ..	2,140,833	2,148.532	D. 7 699	.3
Col. & Rome....	2,416	4.439	D. 2.023	45.9
Gr. B., W & St. P..	53,098	28 8 9	I. 24,279	84.3
Jack., T. & K. W.	25,234	15,559	I. 9,675	62.0
Kentucky Cent....	88,605	72,419	I. 16 186	22.3
Louis. & Mo. R....	46 466	42,444	I. 4 022	9.4
Minn. & St. L....	113,459	118 787	D. 5,328	4.4
Northern (S. C.).	33 006	30,160	I. 2,546	8.3
Petersburg	29 874	27 836	I. 2.038	7 2
P. Royal & Aug..	16, 25	14.592	I. 1,533	10.5
P Roy & W. C.	14,455	16,082	D. 1,627	10 1
Rich. & Peter'b..	20,039	17.191	I. 2,848	16 5
Rome Wat & Og.	271,965	232,101	I. 39,864	17 1
Scioto Valley.....	63,489	50,525	I. 12,964	25 6
So. Pac. Co:				
Gal., Ha & S. A.	215,713	201,966	I. 13,747	6 8
Louisia. & West.	65,718	48,710	I. 17,008	34.9
Morgan's L. & T.	295,023	282,566	I 3 .457	12 3
N. Y., T & M..	11,774	12,438	D. 664	5.3
Texas & N. O..	99,105	80,081	I. 19 024	23.7
Atlantic System	687,333	605,760	I. 81,573	13 4
Pacific System .	2,199,928	1,985.969	I. 213,959	10 7
Total	$2,887, 60	$2,591.729	I. $295,531	1 .4
Wab., E. of Miss.	558,850	536,327	I. 22,5 3	4 1
Wil., Col. & Aug..	45,580	45,796	D. 216	.4

Month of June:

Central Pacific....	$1,171,887	$1,025,274	I. $146,613	14.2
Net	622.920	571,321	I. 50.599	8 8
C., I., St. L. & C..	217,726	193.667	I. 24,059	12.4
Net	70.764	84,8 6	D. 14,072	16.5
Ev. & Indianapolis	17,963	14 927	I. 3,036	20 3
Net.....	8,022	5,870	I. 2,152	36 4
Ev & Terra H....	72,815	65,522	I 6 293	9.4
Net	37,058	35 666	I. 1,392	3.8
Peoria, Dec. & E.	6 .126	56,921	I. 5,205	9.1
Net	19,396	17,721	I. 1,675	9.4
Wabash West....	529.870	.....	.....	....
Net	182,481	.....	.....	....

Six months - Jan. 1 to June 30:

	1887.	1886.	Inc. or Dec.	P.c
Central Pac	$5,887,790	$5,393,372	I. $494 018	9.1
Net	2 643,930	2,811,218	D. 167 288	5.9
C., I, St. L. & C .	1,285,727	1,202.568	I. 83,159	6 9
Net	488,212	457,246	I. 30,963	6.7
Ev. & Ind'apolis..	107.929	74,4 1	I. 33,448	44 8
Net	41 824	34,998	I. 6 825	19 4
Ev & Terra H. ..	39 ,985	329,732	I. 66,253	20.0
Net	195,656	155,791	I. 39 865	25.5
Peoria, Dec. & E.	41 .044	337.367	I. 73,677	21.8
Net	189.950	137,103	I. 52,856	38 5
Wabash West	2,927,698	.....	.....	...
Net	894,596	.....	... .	....

* Includes but three weeks of July in each year. † Mexican currency.

Cotton.

The cotton movement for the week ending Sept. 9 is reported as below, in bales:

Interior markets:	1887.	1886.	Inc. or Dec.	P. c
Receipts.....	47,179	32.251	I. 14,888	46.0
Shipments..... ...	36,178	27.949	I. 8,229	29.4
Stock.....	34,754	49,757	D. 15,003	30.1
Seaports:				
Receipts.....	85,437	42,581	I. 42,856	100.6
Exports.....	18,015	10,570	I. 7.445	70.2
Stock.....	129,049	189,059	D. 60,010	31.7

Chicago Freight Shipments for August.

The following statement shows the gross tonnage of export and domestic freight and also the aggregate tonnage carried by the various roads from Chicago during August; also the percentage carried by the various roads:

Route.	Export tons.	Per cent.	Domestic tons	Per cent.	Total tons.
Baltimore & Ohio.....	11,128	24 3	11,311	11.2	22.439
Chi & Grand Trunk...	5 646	12 3	8,851	8.7	14 497
Chi., St L. & Pitts ..	4.966	10 8	10,502	1 .4	15.468
Lake Sh. & Mich. Sou.	5.249	11 4	18,890	18 6	24,139
Michigan Central... ..	7,791	17 0	16,933	16.7	24,784
N. Y., Chi. & St L....	937	2.1	9,527	9 4	10 468
Pitts., Ft. Wayne & C.	10,154	22.1	24,421	24.2	34,575
Cin., Ind., St. L. & Chi.	....	964	0 8	964
Total	45,871	100	101,459	100	147.330

Coal.

The coal tonnages for the week ending Sept. 10 are reported as follows:

	1887.	1886.	Inc. or Dec.	P.c.
Anthracite	737,526	705,591	I. 31.935	4.5
Bituminous..... .. .	284,345	241,534	I. 39.811	16.2

Cumberland coal shipments for the week ending Sept. 10 amounted to 66,252 tons, and for the year to that date, 2,151,014 tons.

The coal tonnage of the Pennsylvania road for the week ending Sept. 3, is reported as follows:

	Coal.	Coke.	Total.
Line of road	181 040	84.166	265,206
Year to Sept 3.....	6.893,689	2,252,448	9,146,537
To Sept. 3, 1886.....	5,597,719	2,307,143	7,904,862

Manitoba Wheat Rates.

A Minneapolis dispatch says that the Canadian Pacific has reduced the rate on wheat from Winnipeg to Port Arthur (Lake Superior) 5 cents per 100 lbs., apparently with the intention of forestalling competition by the proposed new road to the United States boundary.

Transcontinental Traffic.

The new transcontinental fast freight line, composed of the Canadian Pacific, Rome, Watertown & Ogdensburg, and New York, Ontario & Western railroads, brought to New York on Sept. 14, 17 cars of freight which had left Vancouver, B. C., on Sept. 3. The freight had come to Vancouver from China.

Illinois Railroad Commissioners.

At the regular meeting last week of the Illinois Railroad and Warehouse Commission the Ohio & Mississippi was ordered to change its practice in the matter of delivering freight to the Wabash road at the junction of the two roads at Taylorville, Ill., which had been complained of as discriminating. Action was taken toward entering a suit against the Michigan Central to compel it to obey the state law regarding hopper scale weights of bulk freight. The Chatsworth disaster was not considered, and will be taken up at the October meeting.

Export Rates.

The Executive Committee of the Trunk Line Association, together with representatives of the Central Traffic Association, held a meeting in New York, Sept. 13, to consider the charges of rate cutting on export freight from Chicago, which have been made against several roads during the past few weeks, but no decisive action was taken. Among those present were Messrs. G. R. Blanchard, Frank Thomson, Samuel Spencer, H. J. Hayden, S. M. Felton, Jr., B. L. Hegeman, J. D. Layng, John Newell and H. B. Ledyard. These, with M. E. Ingalls and others, were appointed a committee to investigate the charges.

Members of the New York Produce Exchange have chosen a committee to appeal to the National Commission to compel the roads between Chicago and the seaboard to cease taking export grain and provisions at lower rates than are charged on shipments for domestic consumption. At their meeting, Sept. 13, they passed resolutions to the effect that the discriminations were common and susceptible of easy proof. They assert that the Pennsylvania road takes large shipments to Philadelphia and Baltimore nominally for export, and then allows them to be stopped off at those cities, thus cutting the rate.

Lake Superior Ores for Eastern Markets.

We take the following extracts from a letter we have just received from a prominent shipper of Lake Superior iron ores, and which we commend to the officials of some of our Eastern railroads:

In regard to Lake Superior ores going east of the Alleghenies, I have no doubt they will. They are now going in a small way, and would to a much larger extent if the railroads leading eastward from Buffalo would provide better dock room for large vessels and such handling appliances as are necessary and in common use at other Lake Erie ports. The New York, Lake Erie & Western, for instance, does not give us a dock at Buffalo at which the ordinary-sized vessels in the ore trade can get along side without lightering. We are trying to obtain a remedy for this. It may be that the Lehigh Valley can do better as to docks at Buffalo. * * * The larger vessels now used on the lakes are insuring a perminently lower rate of lake freight, and if the railroads would encourage the business a large amount of Lake Superior ore would go on to the Hudson River and into the eastern Pennsylvania, to the mutual advantage of the seller and the consumer. The coal trade West certainly admits of this. On a haul as long as from Buffalo into the valleys of the Lehigh and Schuylkill there should be a fair and even outgoing rate of freight. We ourselves would send 100,000 tons there next year if, with at all reasonable rates of railroad freight east of Buffalo, they would give us docks and appliances at Buffalo for our large vessels. It is strange that a railroad to which such a business would be valuable should not take care of it. I think the time is near, however, when Lake Superior ores will go in quantity into eastern Pennsylvania. They will do this just as soon as the railroads say they want the business and are willing to provide for it.—*The Bulletin.*

Central Traffic Association.

At the September meeting in Chicago the following resolutions were adopted:

That the Association establish a rate hereafter on thousand-mile tickets of 2½ cents per mile, no tickets to be sold for less than one thousand miles, nor for less than 2½ cents per mile, and with the same limitation as agreed to for thousand-mile tickets as to person and time.

* * * That arrangements be made to call a meeting of the Michigan and Toledo lines at Detroit, with a view of reconciling them to the rate recommended (they being in favor of 2 cents a mile). That after Nov. 1, 1887, for one year, no excursion rate shall be made, except by agreement of the parties interested, for less than one fare for the round trip, and that no contracts be made now or hereafter extending beyond Nov. 1, 1887. ["Except by agreement of parties interested" would seem in this connection to destroy the whole force of the resolution.—ED.]

Other resolutions referred to lake competition, to the desirableness of getting more roads to join the Association, to the rates on eggs, on provisions in refrigerator cars, and on transcontinental traffic; to rules concerning violation of agreement concerning ticket rates; and to the practice of rebilling east-bound grain at intermediate points west of Chicago which reduces the proper share of the lines east of that city.

Ticket Commissions.

The disagreement between the Chicago, Rock Island & Pacific and the trunk lines concerning the non-payment of commissions was still unsettled at last accounts. The agreements sent out were forwarded by the eastern roads individually, and the Rock Island, when it finally acquiesced, signed the papers of all the roads except the Pennsylvania; but the trunk lines, when it came to taking action for the resumption of the sale of tickets over the Rock Island, acted in their associate capacity; and Pennsylvania being of course still unwilling to sell those tickets, the other lines all take the same position.

Low Emigrant Rates.

The Southern Pacific will, it is stated, shortly forward a proposition to its eastern connections, offering to carry emigrants from Chicago to San Francisco on the basis of $15 for through rates, provided they will accept a pro rata proportion of the through rate.

Cutting Passenger Rates.

Passenger rates between Chicago and St. Louis and the seaboard have been seriously disorganized the past week. The limited excursion tickets from western points to Philadelphia for the Constitutional Centennial celebration in that city, Sept. 17, were sold freely at one limited fare for the round trip, which is much lower than the rate fixed by the announcement made a month ago, which stipulated that single-trip tickets should be issued at not less than 2 cents a mile, and that the lower rate should apply only to parties of 25 or more. The Pennsylvania men have, it is claimed, sold these tickets without the prescribed iron-clad contract. These low-priced tickets getting into the hands of scalpers very soon affected New York business, and on Saturday last the Grand Trunk road in Chicago sold round trip tickets to Philadelphia at $16.45, and on the same day the Niagara Falls Short Line (Wabash) announced $15 as the regular rate to New York. This made the cutting general, and it soon extended to all the roads and to Indianapolis, Cincinnati and other prominent intermediate points. On Monday of this week cutting had become general on west-bound business, and first the scalpers and then the regular offices were offering in New York tickets to Chicago at $15. Reports from Chicago on Wednesday stated that the roads there had given the legal ten days' notice of a restoration of regular rates. Although the cheap tickets have been very plenty, the scalpers claiming to have all they wanted, a time limit seems to have been inserted in most of them, and all the usual excursion conditions except the purchaser's signature fulfilled, so that a ten days' notice will apparently not be necessary for a return to regular rates. But the $15 rate between New York and Chicago would seem to be of such a character that the legal notice must be given.

ANNUAL REPORTS

Northern Pacific.

At the close of the fiscal year of June 30, 1887, the lines worked by this company were 3,093 miles, an increase of 285 miles over last year. The changes during the year and

those provided for are set forth in the remarks of the President, which will be given below.

The earnings for the last two years were as follows:

	1886-7.	1885-6.	Inc or Dec.	P. c.
Freight	$8,730,547	$8,189,615	I. $540,922	6.6
Passengers	3,269,703	2 897,218	I. 372,485	12.9
Mail	356 346	347,957	I. 8.389	2.4
Express	300,852	241,769	I. 59,083	24.4
Miscellaneous	131,698	53,968	I. 78.030	145 6
Total	$12,789,446	$11,730,527	I. $1,058,921	9.0
Operating expenses and taxes	7,173,020	6,156,264	I. 1 016.756	16.5
Net earnings	$5,616,428	$5,574,264	I. $42,165	0.8
Gross earn. per mile	4.447	4,316	I. 131	3.0
Net " "	1,953	2,051	D. 98	....
Exps., p. c. of gross earnings	53.99	50.46	I. 3 53	....
Per c., incl'g taxes.	56.90	52.48	I. 4.42	....

The operating expenses for two years are divided as follows:

	1886-7.	1885-86.	Inc. or Dec.	P. c.
Conducting transportation	$1,960,555	$1,682,108	I. $278,448	16.0
Motive power	2,209,680	1,902,228	I. 307,453	16.1
Maintenance of cars	763,746	605,956	I. 157,789	26 0
Maintenance of way	1,595 523	1,341,495	I. 254 028	18.9
General expenses	375,913	387,513	D. 12,400	3.2
Total operat'g exps.	$6,904,617	$5,919,300	I. $985.317	16.6
Taxes	268,403	236,964	I. 31.439	11.6

The income account was:

Net earnings as above		$5,616.428
Interest and dividends, etc		474,366
Total income		6,090.794
Rentals	752.758	
Guarantees to branches	696,650	
Terminal property at Portland	6.446	
Interest on funded debt	4,456 536	
Sinking funds	112 699	
		6,025,088
Net surplus		$65,707

The balance sheet, condensed, was:

Assets.

Railroad, telegraph, equipment and lands	$160.102,305.73
Sundry stocks and bonds	2,238,712.51
Cash in hands of trustees, applicable to the cancellation of bonds	189,908.33
Trustees sinking funds	957,718.87
Accounts receivable	3,339 707 97
Bills receivable	557,765 52
Supplies on hand	1,425,445.95
Deferred payments on land sales	3,887,665.76
Cash	1,932,266 21
	$174,631,496.85

Liabilities.

Common stock	$49,000,000 00	
Preferred "	37,786,199.17	
		$86,786.199.17
First mortgage bonds	$46.878,000.00	
Second " "	20,000,000.00	
Pend d'Oreille mortgage bonds	3,031,000.00	
Missouri Div. " "	2,160,500.00	
		72 069,500.00
Dividend certificates		4,640,821.20
Interest on funded debt:		
Due for coupons not presented	84,051.45	
Accrued to date, not due	1,885,859.26	
		1,969,910.71
Bills payable		1,054,401.03
Accounts payable		3,479.963 28
Unpaid balances outstanding land contracts		1,178 930.94
Suspense account		19,945.55
Earnings invested in equipment		2,205,239.29
Sinking funds		957,718.87
Profit and loss		268,866.81
		$174,631,496.85

The following is a summary of the receipts and expenditures for the year:

Receipts.

From gross earnings	$12,789,448.10
" dividends and profits on investments	374.518.96
" interest	86,878.93
" sundry items of profit and loss	12,938.55
" increase in funded debt	3,833,000 00
" " interest on funded debt	87,608.92
" " accounts payable	1,566,444.27
" " bills payable	170,576.95
" " amount uncollected account land sales	196.404.81
" " accumulated sinking funds	339,524.47
" decrease in funds on hand applicable to sinking fund charges	298,696.73
" decrease in sundry assets	622,550.90
" " cash on hand	297,980.30
	$20,676,601.89

Expenditures.

Operating expenses, rentals and taxes		$7,932,223.01
Interest on funded debt		4,456,535.66
Sinking fund charges	$536.711 68	
Less provided by sales of land	424,013.01	
		112,698.67
Guarantee to branch roads		696,650 00
Construction		3,702,097.74
Equipment		422,385.70
Preferred stock cancelled by land sales		272,111.82
Increase in investments		183,013.25
" supplies on hand		254,167.03
" accounts receivable		1,104 023.89
" bills receivable		557,765.52
" cash in hands of trustees for cancellation of bonds		116,753.95
" deferred payments account of land sales		211,461.76
" payment to trustees' account sinking fund		376,024.47
" suspense account		4,539 37
Decrease in sundry liabilities		274,450.05
		$20.676,601.89

Certain traffic statistics are given below:

	1886-7.	1885-6.
Train-miles:		
Passengers	2,308.747	2,250,456
Freight	4,416,944	3,231,046
Number of passengers:		
East local	450,575	328,594
West "	510.039	357,100
East through	8,377	5,807
West "	10,514	9,963
Passenger-miles:		
East local	33.977,963	28,630,834
West "	45,303,981	34,634,541
East through	14 512,798	10,135,278
West "	18,164,044	17,171,192
Tons freight (construction freight not included):		
East local	905,649	735,733
West "	1,119,697	754,627
East through	17.694	17,857
West "	41,979	29,359
Ton-miles:		
East local	208,254,118	232,458,268
West "	205,746 307	156,709,409
East through	26,799,794	30,847,891
West "	67,684,272	51,100,277
Average train load:		
Number passengers	48.5	41.
Tons freight (includes construction freight)	122.	149.
Earnings per train mile:	1886-7.	1885-6.
Passenger	$1.701	1.549
Freight	1.976	2.535
Expenses per train mile:		
Passenger	0.948	0 956
Freight	1.172	1.063
Revenue per ton mile	0.0163	0.0167
" " passenger mile	0.0302	0.0273
Average journey, miles:		
Local	82	92
Through	1,729	1,738
Average freight haul, miles:		
Local	204	262
Through	1,583	1,736

The earnings from local freight were $594,135 in excess of the earnings from that source the previous year, being 8.23 per cent. increase. The increase in local tonnage was 537,986, or 36.17 per cent. There was a decrease of 881,385 in earnings from through freight, or 11.37 per cent., with an increase in tonnage, viz.: 12,457 tons, or 26.38 per cent. The net increase in earnings from transportation of commercial freight was $599,342. This amount is reduced to $361,422 by the contribution to the various pools in excess of receipts from same sources. The earnings from through freight were 7.3 per cent. of the total freight earnings, and from local freight 89.4 per cent., and from company's construction material 3.3 per cent., only the actual cost of doing the work being charged for the latter service.

The amount of the general first mortgage bonds issued during the year, viz.: $25,000 per mile on 74 miles of constructed road accepted by the President of the United States, was $1,850,000.

The offer of an extension of the time of payment of the dividend certificates to Jan. 1, 1907, has been accepted by the holders of more than $1,000,000. In making the extension, the railroad company reserves the right to pay the principal on any interest day after 1892, upon thirty days' notice. The railroad company agrees that if before the payment of the principal it shall make a mortgage on its railroad and property, it will secure thereby the amount of the dividend certificates. Upon presentation for that purpose, the outstanding $1,000 certificates are stamped for extension, and sheets of coupons attached. Fractional certificates, when presented in amounts aggregating $500 or $1,000, are exchanged for coupon certificates of those denominations.

Arrangements will be made to pay the holders of all certificates that are not extended by Jan. 1, 1888, and after extending the payment the certificates will be sold to other parties.

The earnings of the branch roads in the year ending June 30, 1887, were	$840,726 63
And their operating expenses and taxes were	606,446.90
Net	$234,279.73

being $25,482.87 in excess of the net earnings of the previous year. The amount paid to the branch road companies, as guaranteed, was for interest, $596,020, and sinking funds, $100,630; in all, $696,650.

The earnings on the main line of the Northern Pacific and the St. Paul & Northern Pacific roads, from business secured to those roads by the branches, amounted to $1,378,461.61.

The gross earnings from business passing over the St. Paul & Northern Pacific road between Brainerd and St. Paul, in the year ending June 30, 1887, were $1,422,744.90, 40 per cent. of which ($569,097.96) was paid by the Northern Pacific Co. to the St. Paul & Northern Pacific Co. as rental.

The revenue of the St. Paul & Northern Pacific Co., from all sources, for the year, was		$643,824.28
To which add surplus from earnings in previous years on hand June 30, 1886		365,417.83
		$1,009,242.11
Out of which has been paid:		
Interest on bonds	$388,160.00	
Dividends	300,600.00	
General expenses	6.756.35	
Rental terminal property at St. Paul	45,000.00	
		$739,916.35
Surplus on hand June 30, 1887		$269,325.76

The amount of deferred payments on lands sold is $3,887,665.76. This bears interest at 7 per cent. per annum, and is applicable to the retirement of preferred stock and bonds.

There has been no change in the matter of the claim of the Oregon & Transcontinental Co., as stated in the last annual report.

LAND DEPARTMENT.

The number of acres sold in the year, less sales of previous years cancelled, was 310,355.43, and for	$960,596.61
Town lot sales	92,199.50
Timber and miscellaneous sales	111.495.30
Total	$1,164,291.41
The receipts of the land department in the year were:	
Cash	$815,297.42
Preferred stock	272,111.82
Total	$1,087,409.24
The expenses of the land department in the year were	701,441.09
The approximate number of acres of land to which full title was earned at the date of the last report was	44,864,000.00
Number of acres to which full title was earned in the last year by the construction of 74 miles of road	1,894,400 00
Making total number of acres to which title was earned to June 30, 1887	46,758,400.00
Total sales reported to June 30, 1887	6,139,478.93
Leaving of such lands unsold, June 30, 1887, about	40.618 921.07

This estimate is approximate only, as the exact amount of indemnity land that will be acquired cannot at present be determined. The number of purchasers of the company's lands during the year was 1,720, and the number of entries on Government land within the limits of the company's grant as reported from the Land Offie, was 9,200. For reasons presented by the purchasers and satisfactory to the company, the time of payment on the contract for the sale of lands in Dakota, east of the Missouri River, has been extended to Dec. 1, 1887.

LAND GRANT.

By the construction of the Cascade Branch the company has earned the lands belonging to that portion of the road. The directors feel confident that Congress will never pass any act of resumption or declaration of forfeiture of lands, the full legal title to which the company has actually earned by the construction of the road.

CONSTRUCTION.

Forty miles of the Cascade Branch were accepted by the President of the United States, Dec. 7, 1886, and thirty-four miles were accepted June 13, 1887.

The switchback over the mountains has been constructed and regular trains commenced running between the main line at Pasco and Tacoma, July 1, 1887.

The tunnel through the Cascade Mountains has advanced during the year 2,087 feet on the east end and 2,492 feet on the west end, making a total length of 2,492 feet from the east end and 2,577 feet from the west end, or 5,069 feet in all; leaving 4,781 feet after June 30 still to be driven I has been necessary to line the tunnel nearly its entire length owing to the character of the material.

The bridge across the Columbia River at Kennewick was put under construction in April, 1887. The cost of the bridge will be about $400,000, and it is expected that it will be ready for use in December next. A thorough examination showed that the surface layer of the river bottom consists of coarse gravel from eight to sixteen feet in depth. Underlying this bed of gravel is a bed of very compact clay of unknown depth. The borings have penetrated this clay 64 feet without developing different material. The character of the bottom of the river permits the erection of a less expensive bridge than was originally contemplated. The bridge is a combination timber and iron, and will consist of nine fixed spans of 250 ft. each, with a draw span entirely of iron 237 ft. long moving on a pivot bearing centre.

BRANCH ROADS.

The James River Valley Railroad has been extended from Valley Junction on the Fargo & Southwestern Railroad, 5.3 miles east of La Moure, southwardly 15.2 miles to a connection with the Chicago & Northwestern Railway at Oakes.

The company has taken a lease of the Duluth & Manitoba Railroad. This road extends from a point on the main line of the Northern Pacific 26 miles east of Fargo to the International boundary line, 195 miles, with two spurs each 2½ miles in length. At the boundary line it is to connect with the road to Winnipeg, now under construction by the Province of Manitoba. The Duluth & Manitoba Railroad traverses an exceedingly fertile and well-settled country, and secures to this company a large and profitable business in Minnesota and Dakota, and also the valuable and growing business of its Manitoba connection. The amount of bonds of the Duluth and Manitoba will be $3,000,000, being at the rate of $15,000 per mile. The Northern Pacific Co. agrees to pay as rental the interest on the bonds of the Duluth & Manitoba Co. as it becomes due, and the semi-annual installments for the sinking fund. The road is now being operated to Grand Forks, 105 miles. The extension from Grand Forks to the international boundary will be completed before winter.

The Helena & Red Mountain Railroad, from Helena to Rimini, 15.8 miles, was opened for business Dec. 15, 1886.

The Spokane & Palouse Railway, from Marshall on the main line to Belmont, 43.75 miles, was opened for business Nov. 1, 1886.

The Spokane Falls & Idaho Railroad, from Hauser Junction on the main line to Cœur d'Alène City at the northern end of Lake Cœur d'Alène, 13½ miles, was opened for business Oct. 24, 1886. Steamboats ply between Cœur d'Alène City and Old Mission on the Cœur d'Alène River, where connection is made with the narrow gauge road extending to the valuable Cœur d'Alène mines.

A spur 3½ miles long has been constructed from the main line to the Oelalum coal fields at Roslyn, in the valley of the Yakima River, and was opened for business Dec. 21, 1886.

Arrangements have been made with Hon. S. T. Hauser and associates for the construction of four branch roads in Montana, viz.: Helena, Boulder Valley and Butte Railroad from Jefferson Station on the Helena & Jefferson County Railroad, 30 miles to a point in the Boulder Valley.

Helena & Northern Railroad from Birdseye Station on the main line to Marysville, 12½ miles.

Drummond & Philipsburg Railroad from Drummond Station on the main line to Philipsburg, 26¼ miles.

Missoula & Bitter Root Railroad from Missoula on the main line to Skalkaho, 50 miles.

Messrs. Hauser and associates provide right of way, grade, bridge, and tie the roads, and are paid one-half their outlay in the bonds of the branch companies at par and the other half in freights over the branch roads and the Northern Pacific. The rails are provided from the proceeds of bonds of the branch companies. Traffic contracts are made between the branch companies and the Northern Pacific in which the Northern Pacific Co. guarantees to pay the interest on the branch bonds as it becomes due and sinking fund, as in the case of the other branch roads. By this arrangement many of the prominent business men of Montana have become enlisted in the promotion of the interests of the Northern Pacific Co. in that territory. These four roads will be opened for business in September and October.

A section of the Northern Pacific, La Moure & Missouri River Railroad, is under construction from La Moure to Edgeley, 21 miles. This road connects at La Moure with the Fargo & Southwestern Railroad, and will be extended towards the Missouri River as circumstances may justify.

The construction of the Cascade Branch, including the switchback over the mountains, has been pushed with vigor during the year, and on July 1, 1887, the line was opened for business throughout its whole length, giving a continuous and direct rail connection from Ashland, on Lake Superior, to Tacoma, on Puget Sound—a distance of 1,981 miles. By the construction of the Cascade Branch the lands appertaining to that portion of the road have been earned. These lands embrace vast forests of the finest timber in the world, and coal and iron ore of superior quality and in great abundance. The more the lands are explored, the more productive and valuable they are found to be. Washington Territory has been well called the Pennsylvania of the Northwest. The facilities for making iron cheaply are unexcelled. Arrangements are in progress for building, near the line of the road, works for the manufacture of iron on a large scale. The interchange of business between Eastern and Western Washington—coal and lumber eastward, and grain and other produce westward—will make this the most valuable part of the road. The area of the district between the boundary line on the North, Snake River and the Clearwater on the south, the Bitter Root Mountains on the east and the Columbia River on the west, is 32,700 square miles. By the construction of a judicious system of branch roads the business of this large and productive district can be made permanently tributary to the Northern Pacific. This is the only way for the company to get full advantage from what has been done. If this company neglects to secure the control of this business other companies will hasten to take advantage of the neglect. The directors therefore recommend that the policy that has been pursued in promoting branch roads be continued.

Large additions to the equipment will be needed to meet the growing business of the road. In the last year the sum of $422,386 was expended for equipment. By the plan of reorganization, the net earnings may be applied to providing such additional equipment as shall be necessary for the business of the road. If no other way be provided to pay for the needed equipment, it is plain that the net earnings must be used for this purpose.

The directors have found that the provision in the plan of reorganization that no other bonds shall be issued than the $25,000 per mile therein authorized, except on a vote of at least three-fourths of the preferred stock, so interferes with the management of the property to the best advantage of the preferred stockholders that they have no hesitancy in stating it would, in their judgment, be for the true interest of the preferred stockholders to remove this restriction.